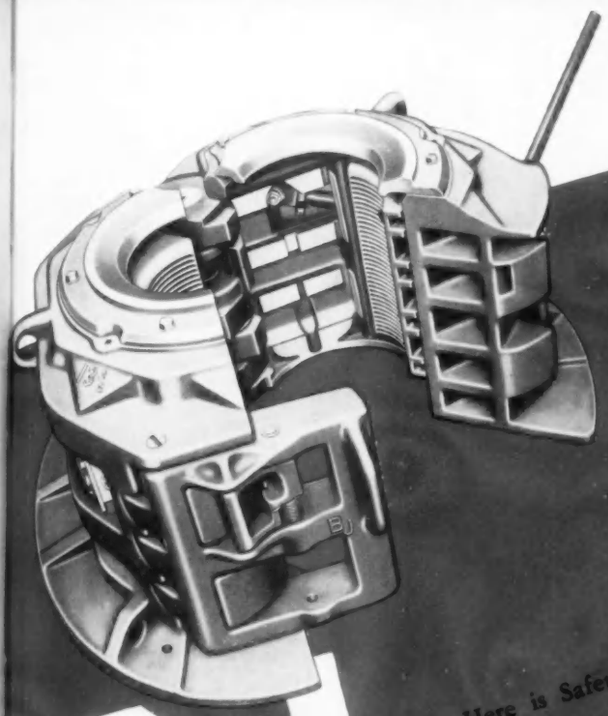
The OIL WEEKLY



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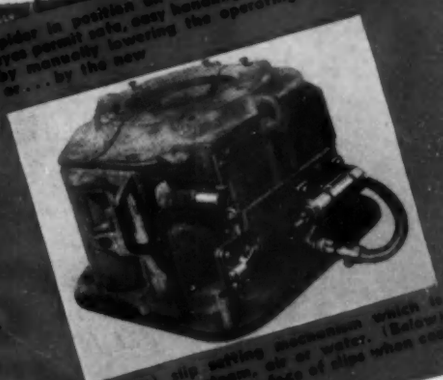
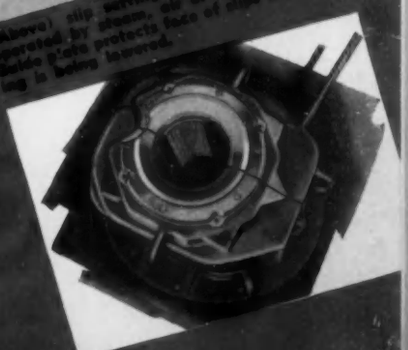


(Above) slip setting mechanism which is operated by steam, air or water. (Below) Guide plate protects face of slips when casing is being lowered.



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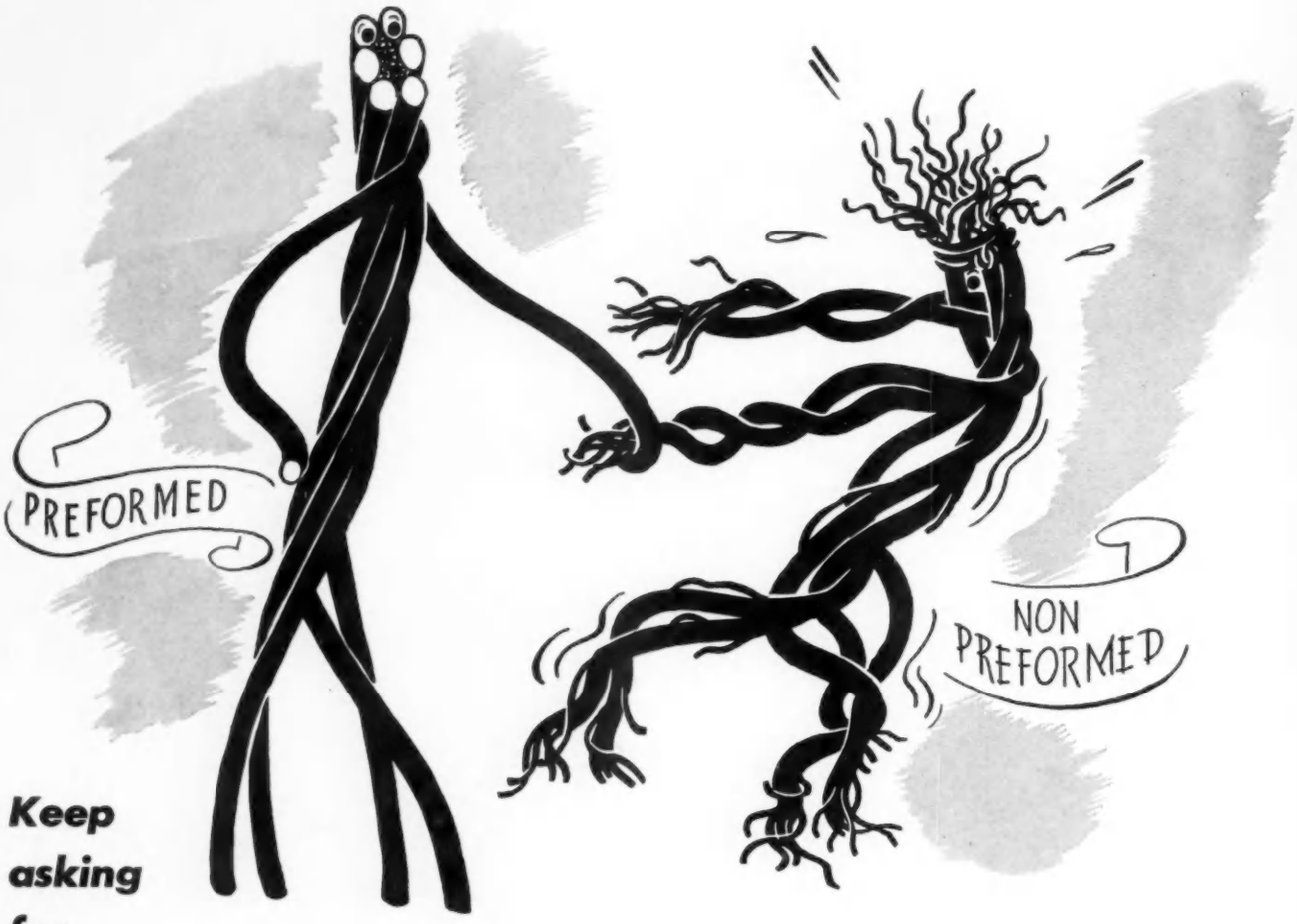

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for the drilling-producing-pipeline industry

PETROLEUM REFINER and The REFINERY CATALOG
for the refining-natural gasoline industry

THE OIL WEEKLY

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LOOKING AHEAD
. . . with the Editor

ACIDIZING lime formations to stimulate production of oil is a common operating practice. So routine has the use of acid for this purpose become, that completion reports now indicate the quantity of acid used to make the well produce.

The growth of this practice and its various applications are to be given in an early article on "Possibilities of Production from Lime Formations Given the 'Acid Test'." The writer began his studies in 1933 and has followed the expansion of the acid idea since then. Very early in these studies he predicted certain possibilities from the use of acid. The forthcoming paper was written to show to what extent actual performances have checked the "future possibilities."

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KEEPING wells pumping efficiently has always been important — now it is vital; and critical shortages frequently make it difficult. Here's another place where "Oilwell's" 10-Point Supply Service can be of value to you.

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Supporting our store men in their efforts to keep your wells pumping are additional features of "Oilwell" 10-Point Supply Service, including: (1) an efficient warehouse system; and (2) experienced subsurface engineers on whom store men can call for help in solving customers' pumping problems. Consider these and other advantages of "Oilwell" 10-Point Supply Service in relation to your equipment needs.

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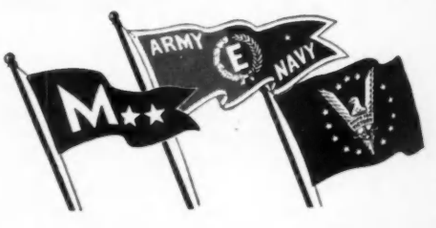

Army-Navy "E"—Imperial Works. Maritime "M" and Victory Fleet Flag—Wilson-Snyder Manufacturing Division.

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The Changing Panorama

Let the Navy Have Its Oil

AFTER 30 years of "ownership," the United States Navy still is not "competent" to administer the oil reserve set aside for its use in an emergency. During the time since Elk Hills was given to it, the Navy has "floated on oil" through one war and is well on its way in another. The powers in Washington think the Navy competent to take billions of dollars worth of ships and thousands of the flower of the nation's manhood and deal with them as it chooses. But the Congress and the Justice Department are agreed that the Navy is not competent to make even such an oil lease as many a one-horse farmer has grown rich with.

It is only to echo the thoughts of a substantial element of the citizenship from the inception of the idea 30 years ago, to say that the best thing would be for the Navy to go out of the oil-reserve business.

To begin with, the reserve was set aside for an emergency, and perhaps for posterity. Both are here.

Aside from the splotches on the escutcheons of men and nation, the money-cost of the scandals and investigations that have attended or emerged from the Navy's "ownership" of this reserve has been such that if and when the oil is produced, its cost can be computed by the drop.

It was an executive order, it will be recalled, that once transferred these lands back to the Department of the Interior, which has the machinery to handle such matters. That there were some "little black bags" thrown into that machinery at that time is a matter well to be forgotten. The Interior Department has the machinery for handling lands, and the Navy, it seems, can never have it.

Congress, we may presume, would be more concerned with the principle that the reserve is the Navy's than with the logic that the Navy needs the oil, and the expediency of securing it for use now. But the logical way of untangling such a legal knot as the one keeping the oil from being produced was Alexander's. And a Congressional resolution suggesting an executive order in the matter should not be followed by the results of the secretive negotiations of the Harding era.

Back in the hands of the proper department, leases could be made for development in keeping with current ideas of economy. Offerings could be made in small enough units that all types of operators could bid for them. Such arrangement would bring about development of the reserve at a time when all known sources should be produced to the limit of economy. Oil from adjacent lands also would be produced—and even from its own lands the Navy can never use oil that has not been through private hands.

Plans looking to confiscation of privately-owned lands in the reserve area would only tie up more oil in hands that are tied—the Navy is a war machine, and it seems unanimous that it does not belong in the oil business. At least Congress and the Attorney General have agreed to that.

The Navy needs the oil, not its legacy.

Fuel Conservation Program Underway

EFFORTS of the National Fuel Efficiency Council in conjunction with research by the Bureau of Mines should result in the accumulation of much valuable information on fuel conservation. Designed to minimize wasteful practices in the use of petroleum gas, coal, coke, and wood, the program is well underway. Nearly 4,000 engineers have volunteered for service, and new enlistments are being added daily, to assist in the program of conserving critical resources.

Several coordinators have already been appointed to direct the work of the volunteer regional engineers in various cities. As the larger fuel users have the greatest opportunities for economies, the program will first be directed toward industrial and commercial plants. Regional engineers will ask each company whose plant they visit to enroll in the program and sign a pledge to cooperate by considering fuel-saving recommendations applicable to its operations. The recommendations will be drawn up following a survey of the plant by the regional engineer and a representative of the company to be designated "waste chaser." Other regional engineers, specialists in fuel utilization problems, will follow up the first visit to offer further assistance and to obtain a record of improvements.

States Make Big Gasoline Savings

GOOD examples are being set in mileage conservation by many states in administration of state affairs. A report recently issued from the Office of Price Administration shows that almost 6,000,000 gallons of gasoline and 11,500 prewar tires were saved in the three-month period ended June 30, 1943, as a result of reductions in official automobile travel by 38 state governments and the District of Columbia.

These savings were made possible through the cooperation of state mileage administrators appointed by the individual governors to carry out the Government Mileage Conservation Program.

This first official summary of reports from the 38 states shows a total reduction, for the second quarter of 1943, of 72,660,097 miles under 1941, or in four cases, 1942 travel for the same. This reduction makes possible a saving of more than $3,500,000 of the taxpayers' money for the three-month period, and marks an over-all 30 percent cut in 1941 mileage figures. The mileage conservation program was officially started in November, 1942, and really got into full swing during the first part of 1943.

Ten Thousand Women Work in Oil Industry

MORE than 10,000 women now are engaged in various branches of the oil industry, and are working even in "he-man" jobs such as common laborers in 100-octane plant construction, it was disclosed by PAW last week.

Most of the women are married, working side by side with their husbands or taking the place of a man in military service, and in most instances receive the same pay, Deputy Administrator Davies said.

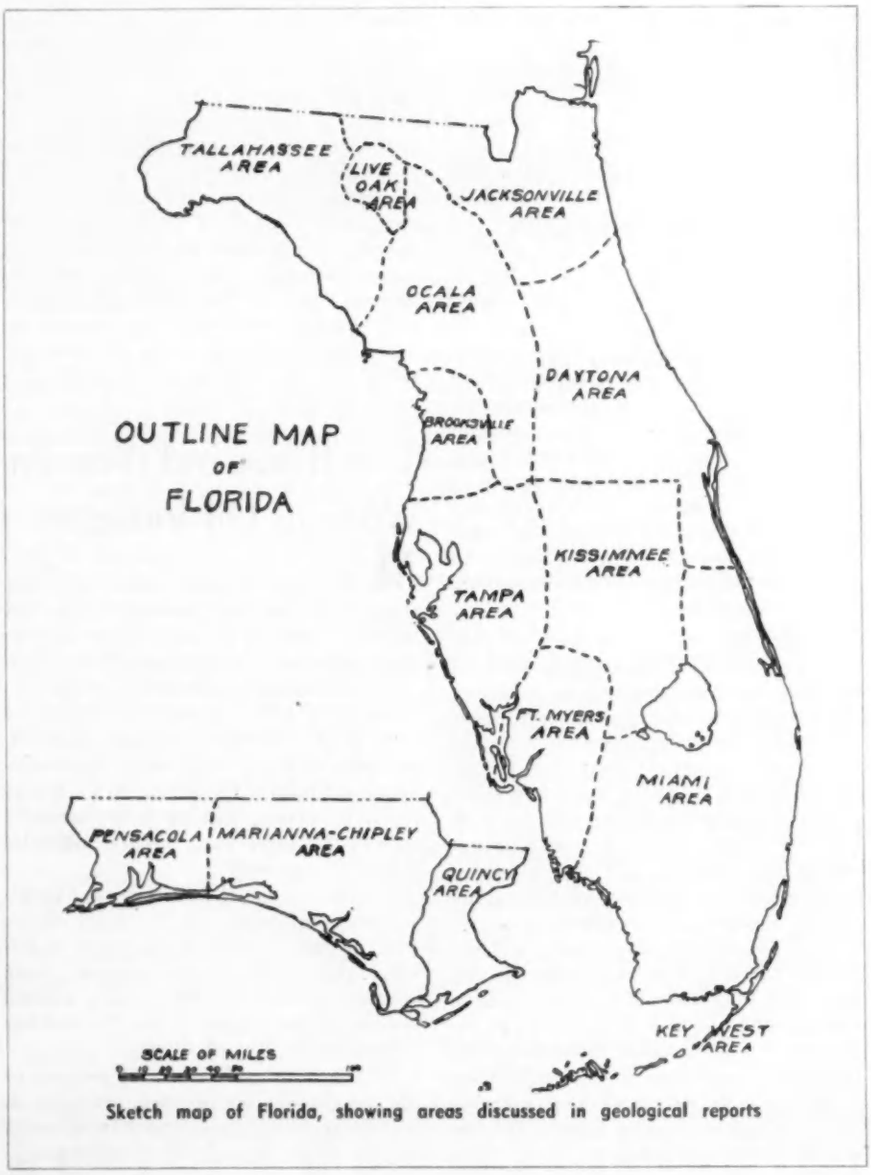
A survey of the extent to which women are employed, he said, shows that in 181 establishments with 65,509 employees, 6339, or 9.7 percent, were women; in the non-office jobs, women accounted for 4.1 percent of the number employed.

In the refining branch, 8.1 percent of the employees are women, working in highly technical and scientific jobs as well as office and unskilled capacities.

Florida Looms as Area for Future Exploration

By RIVERS REAVES, Staff Writer

With Small Amount of Oil Encountered in Collier County Wildcat Discovery, Major Operators Flock to Peninsula State and Lease Approximately 7,500,000 Acres of Land



Sketch map of Florida, showing areas discussed in geological reports

THE oil industry is looking with considerable interest to the Southeastern States as a possible future oil province with the discovery of a small amount of oil in Florida. Present interest is centered mainly on Florida, South Georgia and South Alabama since these areas are believed to be more favorable for oil and gas production. Operators have leased millions of acres in this region, and a number of wildcats are planned for 1944.

Reviewing the possibilities of Florida specifically, some of that state's most outstanding geological features will be considered. The state has an area of approximately 58,666 square miles and has a coast line of 3751 miles.

The state is regarded as being in a favorable position, if large amounts of oil are discovered, to help supply the East Coast. Before the outbreak of World War II, thousands of tankers, loaded with oil from Texas and Louisiana, plied around the rim of the state destined for refineries and terminals in New York, Pennsylvania and New Jersey.

Plenty of Sediments

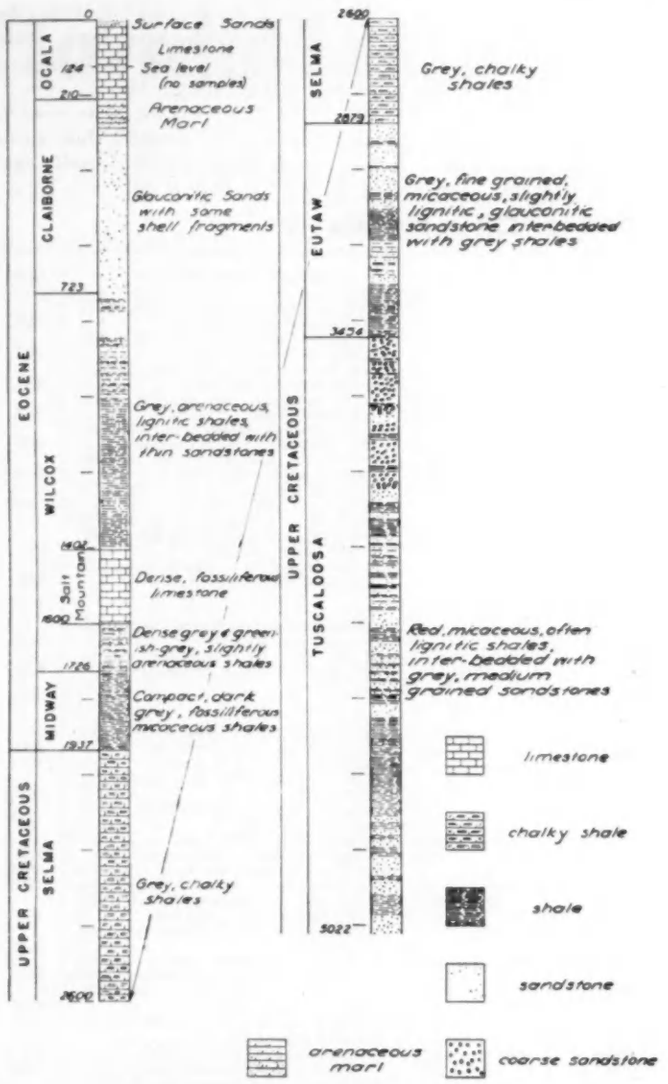
Florida is underlain by marine sediments to depths varying from 5,000 feet to more than 15,000 feet and having a volume in excess of 128,000 cubic miles. These sediments consist of approximately 75 percent limestone or similar calcareous rocks and 25 percent sands and shales. The percentage of limestone varies from approximately 50 percent in the north part of the state to almost 100 percent lower on the peninsula. The formations range in age from pre-Paleozoic metamorphic rocks to Recent sediments. The larger part are Cretaceous and Tertiary.

Despite conditions that have made exploration difficult and ineffectual, approximately 100 wells have been drilled or are drilling in the state. Development has not been restricted to any particular area as test wells have been drilled in 39 counties. Six wells each have been drilled in Pinellas, Levy and Walton Counties, while 5 each have been put down in Sumter, Escambia and Dade Counties. The shallowest test was located near Turkey Creek in Brevard County, depth of 115 feet, while Humble Oil & Refining Company drilled the first producer near Sunniland in Collier County to 11,626 feet, the deepest penetration. The discovery was completed on the pump in November, 1943. A majority of the tests have been drilled in the northwest corner of the state as well as on the Gulf of Mexico side.

A few shallow tests may have been drilled before 1900, but authentic records show the first well was bored in

Wells Drilled for Oil in Florida

COUNTY	COMPANY AND LOCATION	Date	Depth
Alachua	Arnold, Allen & Green, Sec. 27, T9S, R21E. Gainesville, 7 miles northeast	1927	470±
Alachua	Arnold, Allen & Green, Sec. 27, T9S, R21E. Gainesville, 7 miles northeast	1927	650±
Alachua	Arnold, Allen & Green, Sec. 27, T9S, R21E. Gainesville, 7 miles northeast	1928	676±
Alachua	C. L. Arter, Sec. 11, T8S, R19E. LaCrosse, 3 miles south	1943	135 (Drilling 10-23-43)
Brevard	Florida East Coast Oil, Gas & Mineral Company Melbourne, 3½ miles south, near Turkey Creek	1921?	1000±
Brevard	Florida East Coast Oil, Gas & Mineral Company (No. 2) Melbourne, 3½ miles south, near Turkey Creek	1922?	115
Broward	Port Everglades Oil & Gas Company, Fort Lauderdale, Croisant Park	1929	3010
Calhoun	Calhoun Gas & Oil Company, Clarksville, ½ mile northwest Sec. 36, T1N, R10W	1920	1320
Citrus	Pearson Oil Company, Crystal River, 2 miles north	1905	1900
Collier	Humble Oil & Refining Company, Sec. 29, T48S, R30E. Sunniland, Collier County	1943	11626
Columbia	Suwannee Oil & Development Company, Sec. 26, T3S, R16E. Lake City, 4 miles west on Lake Jeffery	1923	1310?
Dade	Sarver & Snavely, north of Hialeah	1924	?
Dade	Florida Petroleum Exploration Company, Florida City, 6 miles southeast	1929	2080±
Dade	Miami Florida Oil Company, Sec. 19, T54S, R35E. Miami, 40 miles west on Tamiami Trail	1932	4570
Dade	East Coast Oil & Natural Gas Company, Kendall, 2½ miles southeast	1933	5535
Dade	Wm. G. Blanchard & Associates, Sec. 31, T53S, R35E. Miami, 44 miles west on Tamiami Trail	1940	6200 (Drilling 10-21-43)
	Wm. G. Blanchard & Associates, Everglades No. 2	1940	1280
Dixie	Florida Oil Development Company, Sec. 7, T11S, R12E. Cross City, 6 miles southwest	1942	4732
Duval	East Coast Oil Company, Sec. 12, T3S, R25E. Jacksonville, 6 miles southwest	1923	1690
Escambia	Pensacola Development Company, Pensacola, East Hill	1901	1620
Escambia	Pensacola Development Company, Pensacola, 5 miles west, 2 miles north of Navy Yard	1901?	1720
Escambia	Southern States Lumber Company, Cantonment, 3 miles west	1905	1435
Escambia	Southeastern Resources Company of Jacksonville, Pensacola, 18 miles northwest	1926	Nine Wells 550±
Escambia	Escambia Oil Company, Pensacola	....	1320
Franklin	Carrabelle Oil & Development Comapny, Carrabelle	....	240
Gadsden	J. L. Shepard, Greensboro	1918	1750±
Glades	Indian Prairie Oil & Gas Company, Sec. 15, T39S, R32E. Palmdale, 15 miles northeast	1926	2770±
Hernando	H. McCurdy, et al, Brooksville, 5 miles northeast	1926	250±
Hernando	Florida Gulf Oil & Gas Company, Bayport	1935	135
Highlands	Brighton, 2 miles west of, on State Road No. 8	1926	1100±
Highlands	Brighton, 1 mile west of, on State Road No. 8	....	Spudded
Hillsborough	R. V. Hill, Sec. 18, T28S, R17E. Oldsmar (Tampashores)	1923	3253
Hillsborough	Lyons & Harris, Sec. 29, T29S, R18E. Tampa, Beach Park	1930	867
Hillsborough	Southern Petroleum Comapny, Sec. 4, T32S, R21E. Wimauma	1935	2856±
Hillsborough	Southern Petroleum Company, Sec. 4, T32S, R21E. Wimauma, 60 feet west of No. 1	1936	964±
Jackson	Mamie Hammonds, et al, Sec. 15, T5N, R9W. Marianna, 8 miles northeast	1936	5022
Jefferson	Southern States Oil Corporation, Sec. 17, T2N, R5E. Monticello, 2 miles northeast	1928	3838
Lake	Oil Development Company of Florida, Sec. 17, T24S, R25E. Groveland, 12 miles south	1937	6129
Lee	Florida Exploration Syndicate, Sec. 10, T45S, R26E. Ft. Myers, 12 miles southeast	1923	2191
Lee	Florida Exploration Syndicate, Sec. 21, T44S, R26E. Ft. Myers, 10 miles southeast	1924?	3018
Leon	Central Florida Oil & Gas Company, Sec. 11, T2S, R1E. Woodville, 3 miles east	1924	3755
Leon	Gulf Development Company, Sec. 11, T2S, R1E. Woodville, 3 miles east	1926	180?
Levy	Bronson Manufacturing Company, Sec. 18, T12S, R17E. Bronson	1927	978
Levy	Suwannee Petroleum Corporation, Sholtz No. 1, Sec. 9, T15S, R13E. Cedar Keys, 3½ miles northeast	1929	4010
Levy	Walker, et al, Sec. 9, T15S, R13E. Cedar Keys, miles northeast	1931	400±
Levy	Florida Oil Discovery Company, Sholtz Land No. 2, No. 1 junked, Sec. 9, T15S, R13E. Cedar Keys, 1600' north of Sholtz No. 1	1937	5266
Levy	C. W. Houk & D. A. Harkey, No. 1 Crapps, Sec. 15, T14S, R17E. Bronson, 13½ miles south of	1939	1310
Levy	Thompson & Pollard Associates, Levy-Lennon Syndicate No. 1, Sec. 16, T13S, R16E. 1 mile west of old Lennon	1943	500± (Drilling)
Manatee	Tri-County Oil Company, Sec. 16, T34S, R17E. 1¼ miles northwest of Palmetto	1925	1265
Manatee	Tri-County Oil Company, Sec. 15, T34S, R17E. 1¼ miles northwest of Palmetto	1927	2665
Manatee	Surprise Oil Company, Sec. 15?, T34S, R17E. 1 mile northwest of Palmetto	1932	792±
Marion	Ocala Oil Corporation, Sec. 10, T16S, R20E. York, 5 miles south	1928	6180
Marion	Flesher Petroleum Corporation, Sec. 35, T14S, R20E. Fellowship, 1½ miles east of	1928	1020?
Marion	J. S. Coeden, Inc., Lawson No. 1, Sec. 25, T13S, R20E. Fairfield, 2 miles south	1928	4334
Monroe	Peninsular Oil & Refining Company, Cory No. 1 Sec. 6, T55S, R34E. Pinecrest	1939	10006
Nassau	St. Marys River Oil Corporation, Hilliard Turpentine Company No. 1, Sec. 19, T4N, R24E. Hilliard, 4 miles northwest	1936	4824
Orange	Hunt Oil Company, H. L. Hunt No. 3, Sec. 15, T23S, R33E. St. Cloud	1943	1700 (Drilling 10-1-43)
Osceola	Kissimmee Oil Company, Sec. 25, T26S, R29E. Kissimmee, 8 miles south	1917	2000
Osceola	Hunt Oil Company, H. L. Hunt No. 1, Sec. 16, T26S, R32E. St. Cloud, 12 miles east	1943	600?-800? (Abandoned cavity trouble)
Osceola	Hunt Oil Company, H. L. Hunt No. 2, Sec. 16, T27S, R32E. Holopaw, 3 miles east	1943	2000±
Pasco	J. M. Critchlow, Dade City, 4 miles east	1917	2200
Pasco	P. E. Bobb, Sec. 34, T25S, R21E. Zephyrhills, 2 miles north	1932	1003
Pinellas	Pomello Oil Company, (C. W. Houk), Safety Harbor, 2 miles west	1927	846
Pinellas	Intercoastal Development Company, Tarpon Springs, Lake Butler, ½ mile east of	1928	620
Pinellas	Nevers-Yerxa, Nevers-Yerxa No. 1, Clearwater	1930	998
Pinellas	Yerxa-Malone, Nevers-Yerxa No. 2, Clearwater	1930	995
Pinellas	Gulf Tidewater Oil Company, Sec. 4, T28S, R16E. Palm Harbor, 3 miles east	1930	700?
Pinellas	Gillespie-Christian, et al, Fugazzi property, Clearwater	1931	700?
Pinellas	Gulf Tidewater Production Company, Sec. 11, T32S, R16E. Southern tip of Pinellas Peninsula	1934	400?
Polk	Polk County Oil Company, Sec. 31, T27S, R25E. Auburndale, 4 miles northwest	1923	752
Polk	Van Horn & Critchlow, Sec. 29, T26S, R25E. Polk City, 1 mile north	1925	3284
Polk	West Frostproof Land & Oil Company, Sec. 4, T32S, R27E. West Frostproof, 2 miles south	1926	735±
Polk	Florida Pioneer Oil Company, Sec. 28, T30S, R25E. Bartow, 3½ miles southeast at Kissengen Springs	1928	4545
Sarasota	Associated Oil & Gas Company of Florida, Incorporated, Sec. 31, T39S, R21E. Murdock, 5 miles north	1928?	1332
Sumter	Pearson Oil Company, Sumterville, 2½ miles south	1903	2002
Sumter	Pearson Oil Company, Sumterville, 2½ miles south	....	....
Sumter	Dundee Petroleum Company, Sec. 36, T20S, R22E. Bushnell, 4 miles northeast	1918	3090
Sumter	Stephens Oil Company, Sec. 33, T29S, R22E. Bushnell, 4 miles north	1930	830
Sumter	S. Stephens, et al, Sec. 33, T20S, R22E. Bushnell, 4 miles north	1933	612
Suwannee	Wm. G. Blanchard, et al, Sec. 35, T3S, R11E. Luraville, 4 miles northwest	1937	200±
Suwannee	J. W. Phillips Oil Explorations, Sec. 14, T4S, R14E. McAlpin, 3½ miles east	1938	600±
Wakulla	Bonheur Development Company, Sec. 16, T3S, R1E. Burns	1919	2169
Wakulla	Bonheur Development Company, Sec. 16, T3S, R1E. Burns	1921	2000?
Wakulla	Brown-Ravlin Trustees, V. G. Philips No. 1, Sec. 14, T3S, R2E. Wakulla, 2 miles east	1943	5766
Walton	Florida Oil Company, Sec. 16, T3N, R20W, DeFuniak Springs, 7 miles west	1920	1888
Walton	Florida Oil Company, Sec. 17, T1N, R17W. Bruce	1920	770
Walton	Electric Geometer Corporation, Walton Land & Timber Company No. 1, Sec. 12, T1N, R19W. DeFuniak Springs, 10 miles south	1933	5375
Walton	Sanford & Arrington, Walton Land & Timber Company No. 1, Sec. 17, T1N, R18W. DeFuniak Springs, 12 miles southeast	1942	6017 (Reported)
Walton	J. R. Sealy, Sealy's No. 1, Sec. 5, T2S, R18W. Freeport, 5 miles southeast	1943	759 (Drilling 9-6-43)
Walton	H. H. Givan et al, Marion Corporation No. 1, Sec. 11, T1S, R20W. Portland	1943	2736
Washington	Chipley Oil Company, Sec. 27, T4N, R13W. Chipley, 4 miles south	1921	4912
Washington	Chipley, 6 miles south, near Orange Hill	....	1250±



Log of Granberry Well, SEc SW NE 15-5n-9w, in Jackson County, Florida
(From Florida Geological Survey Bulletin)

1901, a year contemporaneous with the Spindletop in Texas. The first mention of oil in Florida is believed to have been made in 1880, when A. A. Robinson, commissioner of the board of immigration, Tallahassee, wrote to S. F. Peckham, special agent of the census office at Washington.

"There is in the midst of an impenetrable cypress swamp near the coast in Jefferson County, and about 35 miles southeast of Tallahassee, a mysterious column of black smoke which has been rising for 20 years. At night it emits light—fitful, and irregular—frequently lighting the sky so as to be seen miles away at sea. It is supposed to be a petroleum spring on fire. Much money, time, and enterprise has been expended to explore the swamp. No one has ever succeeded. It must be petroleum or a volcanic eruption."

The Florida Geological Survey in its seventeenth annual report divides the state into 14 geographic areas, shown in an accompanying map, and points out some of the little known data about each. The extreme western part of the state is designated the Pensacola area. In this area the oldest formations exposed at the surface are the Miocene marls in northeastern Okaloosa County. Along the Yellow River the Oak Grove sand can be seen at the type locality near Oak Grove and near the east county line; along the Shoal River are shell marls referred to as the Shell River formation.

East and south of these outcrops, younger formations of sand and clay come into the section, probably of Pliocene and Pleistocene age. Almost all of Escambia County and a large part of Santa Rosa are covered by the clays, sands and gravels of the Citronelle formation with a mantle of Pleistocene sands in the region lying nearer the coast.

More Interesting Data

The Marianna-Chipley area presents more information and offers a better field for possible detailed information on any structure that may exist than any other. The many rivers in the area are helpful in furnishing cross sections, plus what wells have been drilled, and there is a range of elevation. The area is known to be structurally high, but whether or not local structures can be found with sufficient closure is a problem to be solved only through obtaining additional information on the various limestones.

The Quincy area, which lies between the Apalachicola and Ocklocknee Rivers and including Gadsden, Liberty and Franklin Counties, is one of the topographically high areas in the state but is lower structurally than the area to the west. Sellards and Gunter published a detailed account of the area in tenth annual report of the Florida Geological Survey.

The area between the Ocklocknee and Suwannee Rivers, except Hamilton County, is included in the Tallahassee area. It is predominately a limestone country, though these formations are deeply buried in some sections. Stratigraphically the highest portion is in the east and southeast where the Ocala limestone comes to the surface over practically all of Dixie County, much of eastern Lafayette and a small portion of Madison bordering the Suwannee River. The general area is not as high structurally as the Marianna-Chipley area or the Live Oak area.

In the thirteenth annual report of the Florida Geological Survey, the following passage appeared: "The dominant structural feature of Eastern Florida is an anticlinal fold, or arch, which trends south-southeastward and forms the axis of the peninsula. The axis of the arch passes near Live Oak, 10 to 20 miles west of Gainesville, and an equal distance west of Ocala, and is the southern continuation of the broad anticlinal area of south-central Georgia. Along this anticline there are two high areas. The highest part of one, called the Ocala uplift, appears to be in eastern Levy County; that of the other is near Live Oak. The Ocala uplift is the larger and higher. The Ocala uplift is separated from the uplift near Live Oak by a low area, or saddle, which runs parallel to the axis of the anticline to a point near Santa Fe River, in southern Columbia County."

A considerable area in Central Peninsular Florida consisting of Alachua, Gilchrist, Marion, Levy and Sumter Counties and a part of Columbia and Union Counties is included in a large structural dome or anticline. In this area,

which may be called the Ocala area, the Ocala formation of Eocene age is the country rock. The Miocene is practically absent except for a few loose boulders of the Tampa scattered on the surface near Fort White. What has been said concerning the Live Oak area is generally true of the Ocala country. The structure is very large and there are little definite data on the degree of closure or the presence of smaller sharper structures upon it.

The Brooksville area, made up of Citrus, Hernando and a part of Pasco Counties, is really an extension of the Ocala area. The northern portion, consisting mostly of Citrus County but including a small part of the northeastern corner of Hernando County, is immediately underlain by the Ocala limestone and is much like the south part of the Ocala area. The remainder of the Brooksville area is topographically high and the country rock is the Tampa limestone which rests upon the Ocala.

Shallow underground conditions around Jacksonville and in the northeastern portion of the state are fairly well known from a few wells. Surface formations are sands and clays of the post-Miocene and Miocene. Near the coast and throughout the St. Johns valley, sands and clays are abundant and outcrops along Black Creek and in shallow excavations near Jacksonville have shown marl and soft limestone, believed to be of upper Miocene. From meager data it is apparent that the Ocala, from its structural high between Ocala, Gainsville and Live Oak, is dipping steeply to the east and northeast. The rate of dip cannot be told from the scanty records at hand.

The Daytona area includes St. Johns, Flagler, Putnam, Volusia, Seminole, Orange, Brevard, and parts of Lake and Marion Counties. The surface geology of the entire area is of little value in determining the subsurface structure for over much of it there is little relief and almost all the formations are covered with a mantle of unconsolidated sand. On the western side of the area is found the high ridge country underlain by the limestones, sands, and clays of the Miocene and Pliocene. Towards the coast the younger clays, sands and marls come into the section. Subsurface conditions in the northeastern part of the area are partially known by logs of several wells drilled in the St. Augustine area.

The Kissimmee area, composed of Osceola, eastern Polk, eastern Highlands and most of Okeechobee counties, is immediately underlain by the younger formations. In the Kissimmee Valley and south the surface materials are mostly marls and sands of Pleistocene age. Along the western side of this region in the country around Frostproof, Sebring and Lake Istopoga unconsolidated materials of Pleistocene and Pliocene age are found.

The Gulf Coast of South Florida, west of the Peace River and including Hillsborough, Pinellas, Polk, Manatee and Sarasota counties, is an area in which Miocene formations are either at the surface or covered by a thin layer of Pliocene and Pleistocene. This is known as the Tampa area. North and west of Tampa, in the northern part of this area, limestone of lowest Miocene age comes to the surface on the coast and in some stream beds. In the southern part of the area this formation lies at some depth and the younger Miocene, usually represented by the phosphatic sandy marl, rests on it and in turn is overlain by the Bone Valley (pebble phosphate) beds of Pliocene age, the Caloosahatchee marl (Pliocene) and the Pleistocene sands and marls.

The Fort Meyers area is made up of DeSoto, Hardee, Highlands, Charlotte, Glades, and Lee counties. Some of this area, the north and northeast part, is high, rolling country, immediately underlain by the unconsolidated sand and sandy clays of the Chipola, but the remaining and major portion to the south is a region of little relief underlain by marls of Pliocene and Pleistocene age, exposed in the streams but usually masked in the interstream spaces by a mantle of unconsolidated sand.

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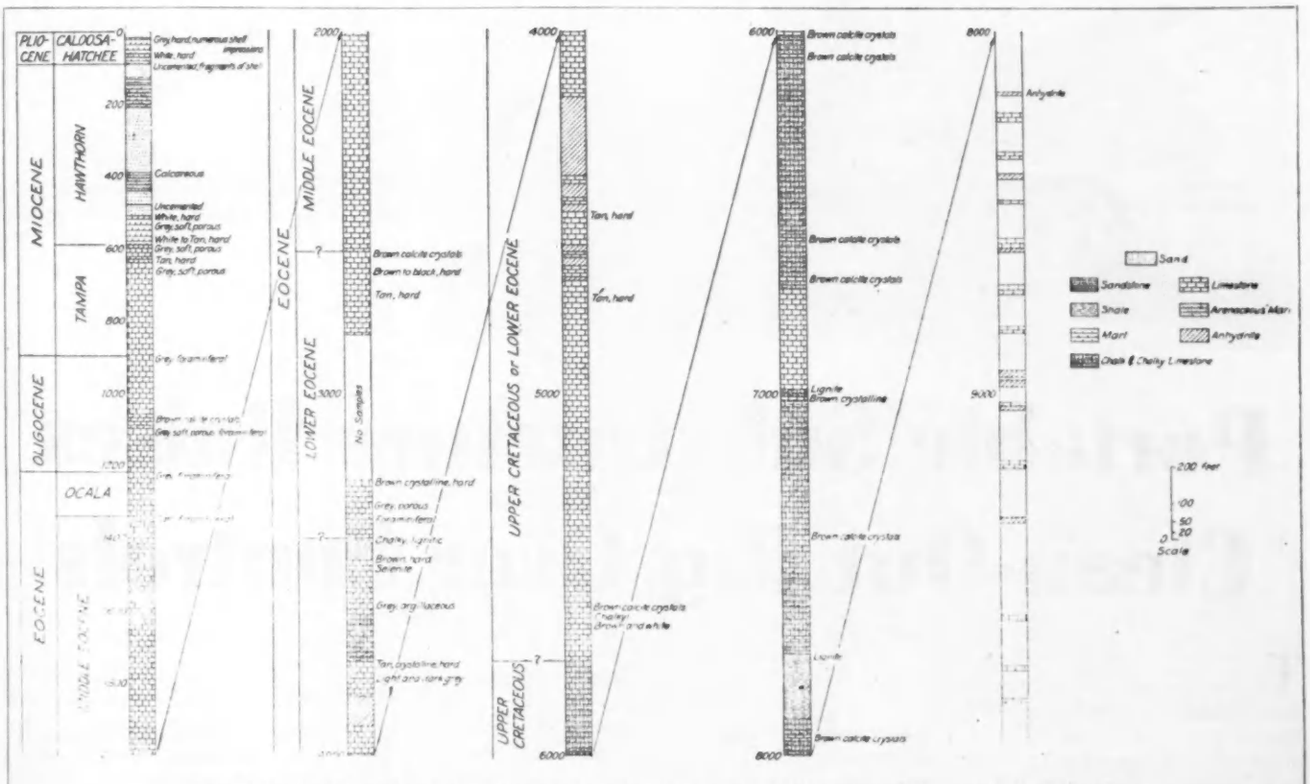
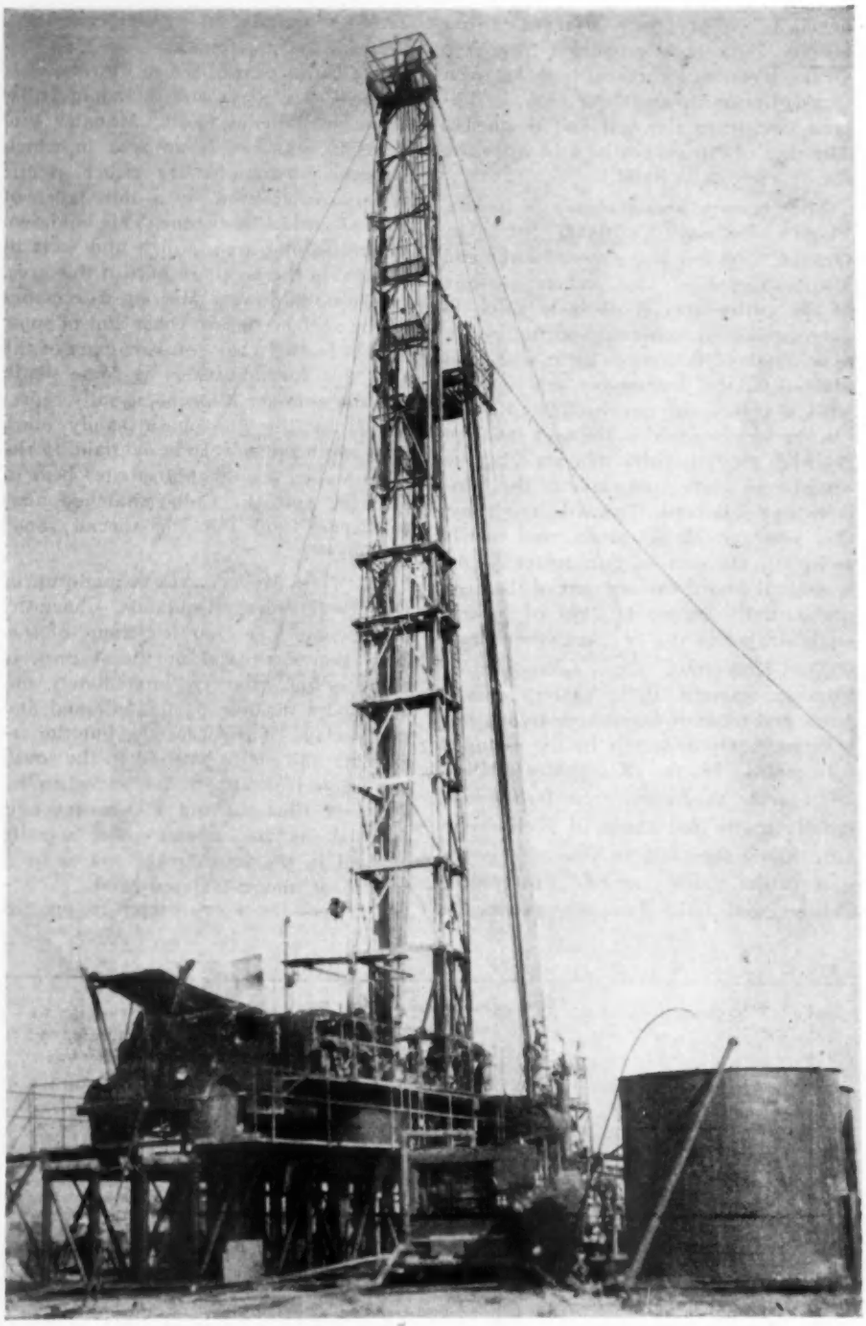


Log of Peninsular Oil & Refining Company's J. W. Cory 1, C NW 6-55s-34e, Monroe County, Florida
(From Florida Geological Survey Bulletin)



Portable rotary rig used for remedial work mounted on substructure built with enough height to clear Christmas tree.

Portable Substructure Raises Clean-Out Rig Over Controls

TO ELEVATE the drilling rig above control equipment installed at the grade line in fields where no cellar was used in original drilling, Amerada Petroleum Corporation is using a metal substructure with success in California. For cleaning out, deepening, and working over wells in such fields, it becomes necessary to get the rig above the surface controls. The substructure was designed for this purpose. It is constructed of condemned pipe, welded together in sections, is portable, and has all service piping permanently attached. A heavy portable rotary rig is mounted on the substructure and operations are then carried on in the usual manner.

The rotary rig is a complete unit, having a telescopic mast-type derrick, carried by and attached to the rear of the frame of a heavy-duty truck. The

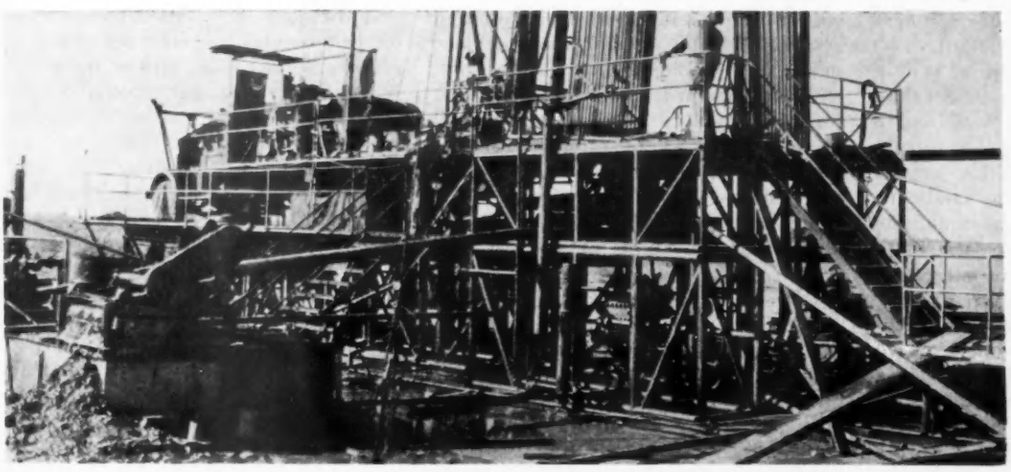
drive for the drilling equipment is made through the truck diesel engine by convenient take-off connections and power controls. A separate engine for auxiliary use in driving the mud pump is set beside the rig on timber mats when circulation is required for certain types of operations that may be necessary. Steel tanks are provided for water and fuel, as well as circulating fluid, all of which may be moved in sections when the rig is taken to a well.

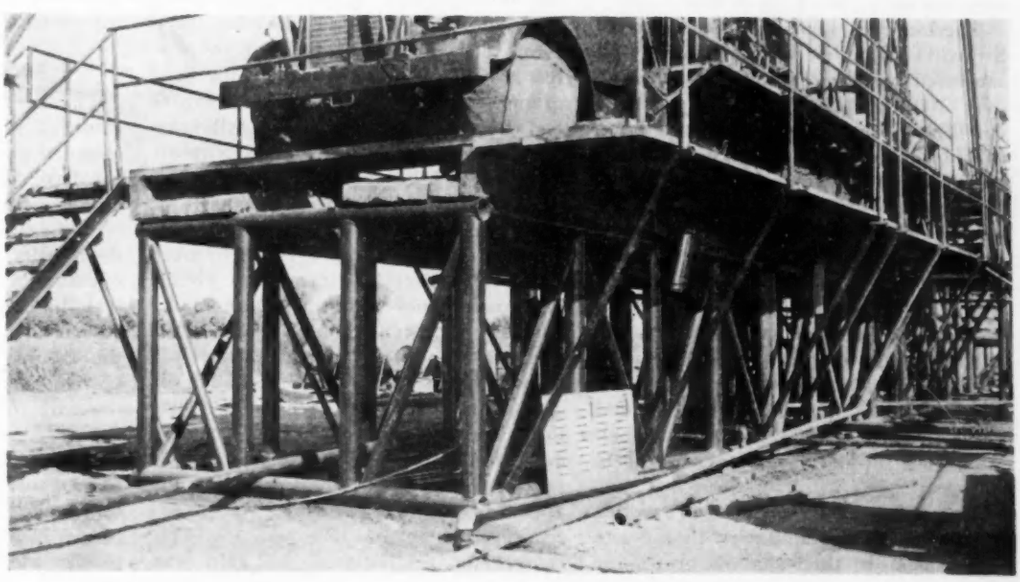
Design of the substructure provides for complete independence of a concrete apron which is sometimes poured at the well at the beginning of drilling operations. The pipe sections which make up the substructure are designed to rest on timber mats which may be recovered when operations have been completed. The mats can be reused at the next well. The sections are substantially constructed, using 4-inch pipe, welded and cross-braced to provide maximum strength and freedom from vibration and shifting. The base, as well as the top of each section, contains four parallel joints of pipe welded to cross members at each end. The top and bottom parallel joints are supported and separated by five sets of risers in groups of four each. The base parallel piping is laid on a flat surface before connecting to provide a continuous bearing surface when placed on the timber mats. Two similar sections are furnished for the truck and the area directly back of the rear end where the driller's controls are located. A third section is used to support the rotary and the derrick floor, and a fourth, similar in construction, is used for the pipe rack.

The sections match against each other, in correct alignment horizontally and vertically, and are connected to each other with loops of wire line and turnbuckles to draw the matching surfaces closely together, yet permitting a small degree of shifting. Extension supports for catwalks are provided by welding 2-inch collars at regular intervals to the lower outside parallel piping into which diagonal pipes are inserted when rigging up. Timbers and dimension lumber are employed for walks and floors, and heavy timbers are laid on the top to support the truck and drilling equipment.

Piping, carrying water, gas and drilling fluid, is connected permanently to the separate sections, and joined to make a continuous line by matching unions. The mud tank is a small vessel, easily handled by truck, and supports a shale shaker which dumps the consolidated particles on the ground, since only a comparatively small quantity of cuttings is recovered during most remedial jobs. The mud pump is set beside the rig on a timber foundation. It is a diesel-driven unit with sufficient fuel storage for operation without frequent replenishment.

A heavy ramp is used for raising the truck and related equipment from the ground to the operating position on the fabricated structure, employing traction power of the truck and assisted by the drawworks as a winch. The truck exhaust is provided with a two-way discharge, one to the muffler, employed when traveling, and the other leading high into the air. Both connections at the exhaust are made of flexible tubing.





These views show details of construction of portable substructure and how it elevates workover equipment above controls when cleaning out.

Cooperative Reservoir Control In the K-M-A Field

Cooperative reservoir control has been successful in a field of 30,000 acres in 375 leases, with more benefits seen in the future

By WM. H. ROUZER, JR.,
Engineer, K-M-A Pressure Maintenance Association

Before Interstate Oil Compact Commission Meeting, Wichita, Kansas, December 10, 1943

THE K-M-A pool covers 30,000 acres of Wichita and Archer counties in North Texas. Oil has been produced since 1912 from formation above 1850 feet, but it was not until 1927 that deeper drilling found oil at approximately 3650 feet in the Strawn section. The discovery well did not look too promising however, and development did not become active until April, 1937, when a big well was brought in. Within the next two years development had covered an area 15 miles long and 8 miles wide. Drilling unfolded a picture of a producing section which graded from oolitic lime through sandstone and sandy limes into sandstone and shales. These deposits are on the south side of the district's main structural feature known as the Red River Arch. It appears that the last active disturbance was during the middle Strawn period when the uplift existed as a chain of islands stretching east and west in a shallow sea, and a promontory extending south from a high point on the uplift brought about the accumulation now known as the K-M-A field.

There are 1611 wells producing from Strawn section horizons which vary in saturated thickness from a few feet to over 100 feet. Because of the erratic conditions found in any one well bore, it is difficult to give average figures on pay thickness, average permeability, or average porosity; however, as a generality the porosity is estimated at 16 percent and the average permeability at 80 millidarcies.

Bottom-hole-sample analysis showed the pool to be undersaturated and the 525 cubic feet of gas per barrel of oil to have a saturation pressure of 1250 pounds, 500 pounds below the original reservoir pressure of 1750 pounds. Stock tank crude oil had an API gravity of 42 degrees.

A number of the owners of properties in the pool were familiar with the gas repressuring of their shallow properties and when the general reservoir conditions became apparent and production caused reservoir-pressure drops in the order of 40 to 50 pounds per month, the idea of returning the produced gas to the formation gained momentum. It was generally realized that it would be advantageous to maintain the pressure within this depletion type undersaturated reservoir which was tight and would not produce at economical rates from gravity drainage alone. There was no market for the produced gas and the logical thing to do was to return it to the formation. A small gasoline plant constructed by Deep Oil Development Company returned gas to its own properties with indications of success.

Small Tracts

The mechanics of doing this over the rest of the field were complicated. One hundred and fifty-four operators were involved and 375 leases split the field into small producing tracts. Few operators owned contiguous acreage large enough for a pressure maintenance project of their own. Gasoline plants had been constructed in the field by three companies. They realized that to protect their investment a gas return program was good business. The operators and the plants discussed the possibilities of a cooperative effort, and in November, 1939, John F. O'Donohoe, then president of the North Texas Oil & Gas Association, issued an invitation to all operators in the K-M-A field to meet to discuss ways and means to obtain maximum benefit from pressure maintenance by gas return to the field. Eighty operators or their representatives attended the meeting. The idea had been discussed thoroughly by a majority of those involved previous to the meeting and after a formal expression of approval the K-M-A Pressure Maintenance Association was formed. An executive committee of 15 operators who represented all parts of the field was elected. This committee was instructed to complete the organization, open an office with a petroleum engineer in charge, and bill the expenses to all of the operators in the field, using a small charge per barrel of allowable oil as a basis. No contracts were written or other legal obligations created except that the gasoline plants attached riders to their regular contracts promising the return of gas to the various leases at a scheduled charge per thousand cubic feet. The K-M-A Pressure Maintenance Association opened its office in January of 1940. An engineer and office force were engaged, the engineer acting as chairman of an engineering committee composed of the employees of the various companies interested in the field. All available information was gathered for study and to facilitate the operations anticipated, the field was divided into 6 units. These units had as their basis a grouping of royalty interests so that waivers could be obtained to allow the return of gas to leases within a general area without a title charge for gas produced by one lease and returned to another.

Expense Distribution

The expense of compressing the gas returned to a unit was distributed between the operators within the unit on the basis of how many wells each operator owned within the unit. The cost of the compressing equipment and the distribution system was shared by the operators and the plants; with the plants installing the compressors and the main return lines and the operators paying the labor costs for connection to this system, title for the equipment remaining with the gasoline plants along with the responsibility to maintain it. The whole structure of these operating agreements is predicated on the benefit to be derived by all concerned from a proper sharing of expenses and probable profits with no long-term legal agree-

ment. The billing of the charges is handled by the gasoline plants with the approval of the association. Because of the various ownerships and the difference in size among properties involved, no differentiation is made between the leases with input wells and those without.

The suggestion for the installation of an input well may come from any one of a number of sources. The engineering committee may decide that it is proper, the operator may suggest it, or the recommendation may come from the offset operator. The first official action is taken by the engineering committee, whose recommendations as to the engineering factors involved are considered by the executive committee before the request for connection is made to the gasoline plant involved. Since the labor cost is billed to all the operators within the unit getting the well, the executive committee acts as an analyzing body with regard to the economy of the expenditure. The executive committee has no legal right to force the gasoline plants to make the connection, but in the history of the operation no request has ever been refused. It is interesting to note that the labor cost when billed to the operator is not a legal obligation, but again there has been no difficulty in collecting the charges. In isolated instances where edge properties receiving a doubtful benefit are included within unit lines the executive committee has simply eliminated those wells when a division of cost has been made. No reimbursement is given the operator who furnishes an input well other than the distribution of the well's normal allowable among other wells on the same lease and the greater benefit he will probably get from it. However, the cost of laying the high pressure line and the cost of compressing the gas is shared by all of the operators in the unit.

Over 3.5 million dollars are now invested in the gasoline plants and the gas return system. The 102 input wells in use represent an additional 2 million dollars in expenditure.

After the original organization work had been completed and arrangements had been made for the facilities necessary to return gas, the responsibility for guiding future operations rested upon the association. Equipping the project for a gas-return program was the beginning and the connection of the input wells made possible the pressure maintenance project, but whether or not the result would be a success or failure depended upon how operations proceeded.

The basis for the association's work has been the statistical records kept by the paid personnel. Each month's operations are recorded and submitted to all the members. The oil and gas production of each lease is tabulated and the gas returned to each well is recorded. Gas-oil ratios are published for each lease and any other information such as periodic bottom-hole pressure surveys and remedial procedures used are included.

Little Friction

The engineering committee and the executive committee meet when action is necessary or advisable. All matters of a regulatory nature are discussed and analyzed by the association's executive committee meeting with any other interested operators after recommendations have been made by the engineering committee. When hearings are called, almost invariably there is no dissension. A united front presents the facts and recommends some particular action. One of the first official public actions of the association was to request the Railroad Commission of Texas to change the proration formula then in effect in the field and to substitute a new formula which had engineering data as a background and which would reduce the allowable on a number of properties in the field. Since that time the problems concerning regulations within the pool have been discussed and studied by all concerned before public hearing and recommendations are made by the K-M-A Pressure Maintenance Association. In this manner all those who are affected or interested are completely informed of all the facts and seldom is there any difference which can not be settled previous to action by the regulatory authorities.

The engineers of the operators, meeting as an engineering committee do not vote in that committee as representatives of their managements, but rather as technicians considering the factors involved to arrive at a proper conclusion.

It is important that this condition be maintained at an engineering committee meeting. The official attitude of the executive committee is the result of the managements of the various companies' consideration of the problem and study of the engineering committee's reports.

As has been mentioned before, there are 102 input wells being used for gas return. The originally connected 46 wells have been supplemented by additional locations throughout the period of the project's operation. A number of wells have been abandoned and others substituted. Changes are constantly being made to fit the reservoir's performance. Basically the reaction from input is the problem of the operator who owns the lease; however, the association's engineer, the engineering committee and the offset operators are also concerned. Recommendations for a change in operation may come from any one of these sources.

The amount of gas returned to the pool has increased considerably during the time the project has been in operation. During 1940 only 129 cubic feet were returned per barrel of oil produced; in 1941 this increased to 340 cubic feet; in 1942 it increased to 507 cubic feet and for the first 10 months of 1943, the average was 614 cubic feet. The project has, to November 1, 1943, returned approximately 14 billion cubic feet of gas to the producing horizon. Compared to cycling projects this may not seem to be a very large figure, but when it is considered that this volume was distributed to over 100 input locations and controlled to maintain a gas drive over 30,000 acres of a tight producing section, the volume assumes greater proportions. No volume of any one well has greatly exceeded a rate of 300,000 cubic feet per day and the average volume has been closer to 100,000 cubic feet per day. Although distribution system pressures are between 1600 and 1700 pounds, the average reservoir pressure in the field is now close to 700 pounds. In some areas an attempt has been made to maintain an approximate equilibrium without a reservoir pressure drop, while in others there has not been a maintenance of pressure but there has been a retarding of drop. Within the first year of the project's operation, the average decline was reduced from 40 to 50 pounds per month to between 4 and 5 pounds per month with approximately the same withdrawal of oil. These figures are averages and are influenced by the areas not taking advantage of the program.

Pressure Maintenance Pays

Although 80 percent of the producing wells in the field are owned by companies actively supporting the project, there are some who have not accepted it. There is one area supporting 106 wells which has not co-operated, mainly because of differences between the operators of the small tracts who would not consider the possibility of their operation assisting any of their neighbors. At the present time they are producing an average of 6.1 barrels of oil per day and have recovered only 1511 barrels of oil per acre. Lifting costs are extremely high and it is generally considered that these wells are at an economic limit. A comparative area containing 324 wells which has wholeheartedly cooperated in gas return has recovered 1752 barrels per acre and is at present producing 19 barrels of oil per day per well under proration. Recently 24-hour tests have produced 100 barrels or more through small chokes from some of these wells. However, the

principles under which these properties have been operated promote the smaller rates of production which are considered an optimum and the operators do not wish to overproduce and damage their properties. The first mentioned area has been operated by rugged individualists who have always believed the optimum rate to be the maximum rate and, as has been mentioned, with a lesser per-acre recovery, have brought about an uneconomic producing condition with all of the wells pumping while the area operated under proper engineering principles is still able to produce a profitable amount of oil per day with 88 percent of the wells still flowing. Calculations of the additional oil to be obtained by this pressure-maintenance program are still difficult.

When curves are drawn to compare the two areas previously discussed, the predicted results appear ridiculous, in that about five times as much oil will be recovered at a profit in the area which has used pressure maintenance. In the field as a whole, it can be said that an additional 20,000,000 barrels of oil have been made available to date; how much that figure is increased depends upon operations in the future. It is felt that the estimation of an increase in recovery of 30 to 40 percent, which was used to justify the installation of the project, will be fulfilled with a considerable volume to spare.

The gas compression cost of the operators has to date been 1½ mills per barrel of oil produced. As control methods become more necessary, the cost of gas return will of course be considerably more than this; and at some time in the future, the amount of gas necessary will cost more than the benefits from it will bring. However, by this time, for a small average cost per barrel, the K-M-A field will have recovered many millions of barrels of oil which would have been lost under conventional operations without the return of gas.

Benefits from this type of cooperative operation are numerous. An effort is made to inform all concerned as to what is happening to other properties and what other operators are doing. The statistical information is quite valuable in that it presents the facts about any property's operations. The operators, when meeting as a group, can understand each others' problems better and look more toward a long term operation with a benefit to all with less cutthroat competition.

The four years of operation of this project have brought to light imperfections. As mentioned previously, there is very little legal contract work to hold the project together, which means that complete cooperation must continue. The groundwork has been laid for the largest conservation project of its type in existence and the operation has been successful to date. However, problems are continuously encountered which must be solved to continue the operation, for the connection of an input well is but the beginning, and the success of that input well is dependent upon the method of injection and the method of operation of the surrounding wells.

The K-M-A field was drilled by a majority of operators who did not own tracts large enough to, in their minds, justify complete analysis of the pay section as they drilled it. Records of a kind were kept, but very little information other than the regular driller's log was obtained. Complete analysis of those sections could have been made at the time of drilling with but little additional cost as compared to the expense now necessary to gather the same information. The operators are aware of the vertical variance in permeabilities, but do not have enough information at hand to follow those streaks from well to well. Techniques are being developed to define these sections for the operators. But most of them are expensive and at this time proper supervision of this experimental work is difficult to obtain. A number of these problems might have been eliminated had additional care been taken at the time of original development. It is believed that the regulatory authorities should consider these factors in their regulations and endeavor in every manner possible to promote the completion of new wells or pools in a manner which may be the difference between a profitable conservation project with a higher percentage of oil recovery, or an abandonment of a large reserve.

The oil industry has developed very efficient methods of reservoir analysis in secondary-recovery fields successfully operating in areas considered depleted a few years ago, but it should be remembered that the analysis shown for many of these fields has only been possible because they are shallow and it has been economically feasible to redrill the fields and obtain the necessary information by that method. It has also been true that a great number of these projects have only been economically successful because of a comparatively high crude-oil price.

Webster says that conservation is the "act of conserving, preserving, guarding, or protecting" and the basis for the legislative acts which have empowered our regulatory bodies is conservation of a natural resource. The act of carrying out that conservation, since it is in the hands of private industry, must be one that is economically feasible to the agent charged with it. Any method the oil industry develops to produce an additional ultimate recovery of oil at a profit is conservation. Regulatory bodies cannot legislate a loss and expect any benefit from it; however, the promotion of practices which will make available additional supplies of a dwindling natural resource is certainly worthwhile.

The Interstate Oil Compact Commission's spring quarterly meeting discussed the promotion of an educational program to make available to the industry additional information on conservation practices. If this is carried forth to a successful conclusion, many of the problems we encounter in such projects as the K-M-A will be solved. However, the information this program intends to convey must include factual data supplied by theorists within the industry. A conservation project must be sold to the participants in it. The general ideas of any of our accepted methods of primary pressure maintenance or secondary recovery are not hard to sell. The related factors such as the possible loss to an offset operator by drainage when gas or water is injected, or the possible loss by drainage to an offset operator because of the back pressure necessary for proper operation, requires an evaluation hard to give. A number of other difficulties due to lack of agreement, even among the experts, are encountered. The practices we promote as being of a conservative nature are still being questioned by a number of authorities within the industry itself. Recent publications have questioned the advisability of prorating a water-drive field below the maximum rate, and although our experience in the K-M-A field has proved the benefits of back pressure and retarded rate, the fact remains that there is far from complete agreement within the industry that these principles are right and proper.

Cooperative reservoir control has been successful in the K-M-A field. Even though the reservoir is not a regular homogeneous sand body and despite the field's division into 375 leases, a benefit evaluated at 20,000,000 barrels of oil has been achieved to date. Future benefits will assume an even larger proportion for cooperation in control has an additional value when production becomes more difficult. This project is a trail blazer and future operations of this kind can be made easier by an examination of its performance.

Every effort should be made by all concerned with the development of a new pool to coordinate the efforts and thinking of the operators and to promote an awareness of the value of cooperative conservation projects and the information necessary to evaluate and operate them.

Determining Probability of Success Of Secondary-Recovery Operations

PART 8

Surface-Tension Effects of Secondary-Recovery

By PAUL D. TORREY
Consulting Engineer, Houston, Texas

RESEARCH performed at the University of Michigan on the physical chemistry of the displacement of reservoir fluids is reviewed with reference to its possible application to secondary-recovery methods. Physical conditions under which water will displace oil are discussed, and the effects of polar compounds occurring in the oil in determining the ease of displacement are emphasized. It is believed that more comprehensive studies may provide a solution to the problem of variable percentage recoveries of the residual-oil content after the primary phase, and also point the way to the recovery of enormous quantities of oil which cannot be produced economically under existing conditions.

This article is part of a symposium on secondary recovery presented at the annual meeting of the American Petroleum Institute, Division of Production, on November 9, 1943, at Chicago. The symposium consisted of 10 papers, of which this is the eighth. Part 7, "Theoretical Calculations for Use in the Installation and Operation of Secondary-Recovery Projects," by George H. Fancher of the Department of Petroleum Engineering, University of Texas, Austin, is omitted here as it was published in THE OIL WEEKLY, June 28, 1943, under the title "Secondary Recovery in Terms of the Engineering Problem." The paper, under the latter title, had been presented by the author before the American Association of Petroleum Geologists at its Fort Worth meeting in April, 1943.

Other papers in the series will be published in future issues.

IT IS recognized generally that the displacement of petroleum and associated fluids from underground reservoirs involves physical effects of a complex nature. These effects have been the object of investigation for several years at the University of Michigan under the auspices of an American Petroleum Institute research grant. The studies by Bartell and associates,[1, 2, 3] although designed purposely to increase the effectiveness of primary recovery, have provided information which, it is believed, may assist materially in pointing the way to a solution of some of the problems connected with the secondary recovery of oil, particularly water flooding. It is probable that the displacement of oil by water in a reservoir is dependent upon analogous mechanics irrespective of whether the water is introduced artificially or is the result of natural encroachment.

It is a matter of record, discussed adequately in other sections of this symposium, that successful water flooding in Pennsylvania is restricted largely to the Bradford and nearby fields. The reason for this is explained as being due to a relatively high residual-oil content remaining in the sand after the primary production phase and to the favorable physical characteristics of the sand body. Within the Bradford field, variations in oil recovery by water flooding are due chiefly to differences in residual-oil content per unit area, indicated usually by variable sand thickness. In the Mid-Continent and Southwestern regions, the application of water flooding has not been so closely restricted. In contrast to the experience developed in Pennsylvania, the percentage recovery from field to field in some instances does not correspond where other determinable factors such as oil saturation, viscosity of crude, and permeability are so nearly identical that similar results might be expected.

The variability of results sometimes secured outside of the Bradford field has perplexed both operators and engineers. As a possible approach to a solution of the problem, some of the studies performed at the University of Michigan are reviewed briefly, no claim being made for originality in the presentation of information and, by the same token, no warranty being offered that the answer to the question of variable percentage recoveries has been attained. However, it is believed that this research does provide a promising foundation for further study which may explain some of the failures and mediocre results obtained in certain areas in the past. Possibly it also may indicate a method to assist in predetermining more accurately the measure of success that may be expected from water flooding in heretofore untested areas and fields.

The sands in which water flooding has been employed most successfully are usually fine-grained and tightly cemented, resulting in rather uniform low permeability. The pore spaces being of capillary size, the surface area of grains exposed in the interstices undoubtedly is of great magnitude. The factors of low permeability and capillary size of pore spaces, combined with the low initial pressures and the wasteful methods of production which prevailed in most of the older fields, have resulted in an inferior primary recovery, and have been responsible for leaving substantial quantities of oil available for secondary-recovery operations. Under conditions such as herein described, it is obvious that the surface forces controlling the retention of petroleum in the pore spaces will have an important bearing on the effectiveness of recovery which may be attained by secondary operations.

Figure 1

The adhesion-tension relationships under conditions where water and oil are brought in contact with the surface of a solid have been illustrated by Benner, Riches, and Bartell[1] as shown in Figure 1, S_{so}, S_{sw}, and S_{ow} represent the interfacial tensions at the solid-oil, solid-

water, and water-oil interfaces, respectively. (The subscripts *s*, *o*, and *w* indicate solid, oil, and water phases, respectively.) If S_{so} is greater than $S_{ow}+S_{sw}$, the water will spread over the surface of the solid, displacing the oil therefrom. If S_{so} should be less than $S_{ow}+S_{sw}$, the system will come to equilibrium at some definite contact angle θ_{ow}, as measured through the water phase. Thus at equilibrium:

$$S_{so}-S_{sw}=S_{ow}\cos\theta$$

And:

$$S_{so}-S_{sw}=A_{sw}-A_{so}=S_{ow}\cos\theta$$

where A is the adhesion tension.

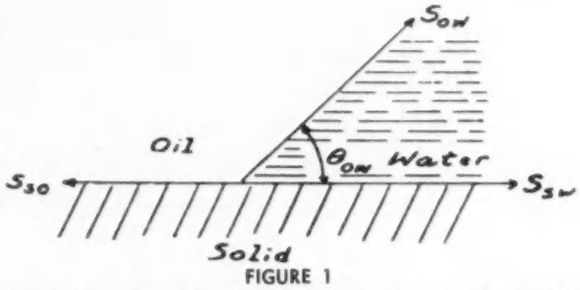


FIGURE 1

Diagram of Interfacial Forces Active at the Contact of Oil, Water, and Solid (after Benner, Riches, and Bartell).

The magnitude of A_{sw} and A_{so}, the adhesion tensions of water and oil, respectively, against a solid, determine whether a given solid will be wet to a greater extent by water or oil. If A_{sw} is greater than A_{so} for a given solid, that solid is preferentially wet by water. As determined by Bartell and Miller,[4] no oil investigated had an adhesion tension greater than that of water, although there is considerable variation in the degree of wetting of silica in crudes from different sources. Therefore, it would follow, in artificial water flooding, that the greater the adhesion tension (A_{sw} between the solid and water exceeds the adhesion tension (A_{so}) between the solid and oil, the more effective will be the displacement of the oil by the introduced water. In like manner, if the value of A_{so} approaches that of A_{sw}, the amount of spontaneous displacement will be small, as indicated by the height that water might rise in an oil-coated capillary. If A_{so} should equal A_{sw}, or if A_{so} should be greater than A_{sw}, no spontaneous displacement will take place. Therefore, it can be deduced that an oil having a low adhesion tension to the reservoir rock should react more favorably to water flooding than one having an adhesion tension approaching that of the injected water. Furthermore, the pressures required to force water into a sand containing a crude possessing a low adhesion tension should be less than for crudes having higher adhesion tensions.

Unfortunately, the information available to date regarding the interfacial forces operating at the contact between oil, water, and a solid have been studied principally for pure silica and pure calcite. Both of these minerals are regarded as being hydrophilic substances but, regrettably, the effect on the relative degree of wetting of the reservoir rock by oil and water where the principal mineral may be coated or bonded with clay cements of various compositions is unknown. However, it may be presumed that certain types of cementing material, commonly found in oil reservoirs, might affect materially the normal contact angle (θ_{ow})from what it would be if the oil and water were in contact with pure silica or pure calcite. Research to determine this unknown effect might result in adding substantially to our knowledge of the mechanics of water flooding.

It has been determined that the interfacial tension between pure hydrocarbons and water and their adhesion tension against any given solid have definite and reproducible values. Crude petroleum is made up of a complex assemblage of hydrocarbons and, in addition, almost invariably contains compounds of oxygen, sulfur, and nitrogen. These compounds, which have been referred to as polar groups, may alter to a great extent the interfacial and adhesion tensions due to the phenomenon of adsorption. It has been shown[2] that the interfacial contact angles (θ_{swo}) formed by water and pure *iso*octane against silica is 30 degrees, and by water and pure naphthenic acid is 35 degrees. However, if 1 percent naphthenic acid is added to *iso*octane, the interfacial contact angle against silica is 62 degrees. Similar conditions have been determined for other mixtures of hydrocarbons and polar compounds.

The chief minerals forming oil reservoirs are silica and calcite, which are acidic and basic, respectively. Both minerals, as mentioned previously, are recognized as being hydrophilic solids. Several determinations of the interfacial contact angles formed by water in contact with various pure hydrocarbons against either calcite or silica show this value consistently to be around 30 degrees. The polar compounds found in petroleum may be either acidic or basic. Adsorption, therefore, might be expected to take place where oil containing a compound, such as naphthenic acid, occurs in a calcareous reservoir. In like manner an oil containing a basic compound, such as quinoline, would be held by adsorption in a siliceous reservoir. These effects, as shown by the University of Michigan research,[2] can have a great bearing on the degree of wetting and the resulting interfacial relationships of the systems. Thus minerals such as silica and calcite, which are normally hydrophilic, might become hydrophobic as the result of adsorption of polar compounds. How important this might be in water flooding is indicated by the fact that the interfacial contact angles of oil produced from the same sand but from different fields, and even from the same sand in different parts of a field, may show substantial differences. Therefore, it may be expected that prevailing surface forces in water-flooding operations might be most helpful in the displacement of oil in one field, whereas in others they might be of little assistance, or actually be deterimental.

Figure 2

From the foregoing, it is evident that measurements of the angle of contact formed between the solid-rock material and the pairs of reservoir liquids should be an indication of the degree of wetting of the reservoir. If the angle of contact between the solid, water, and oil, (θ_{swo}), as measured through the aqueous phase, is less than 90 degrees, it is believed that the water preferentially wets the rocks, and will displace the oil therefrom. However, if the angle is greater than 90 degrees, the rock would be wet preferentially by oil, and the oil would displace water. If the angle should be exactly 90 degrees, the system would be in equilibrium, with no displacement action. These effects are illustrated in Figure 2. Thus it would appear that the nearer the interfacial contact angle formed by the oil and water in contact with the reservoir mineral approaches that formed by pure hydrocarbons and water (around 30 degrees), the greater will be the ease of displacement of the oil by water introduced into the reservoir.

Figure 3

Insofar as is known, all of the oil sands which are being water-flooded with any degree of success contain connate water in varying amount. Whether this water occurs as a thin film covering the grains and encasing minute globules of oil, or is held (as suggested in another section of this symposium)

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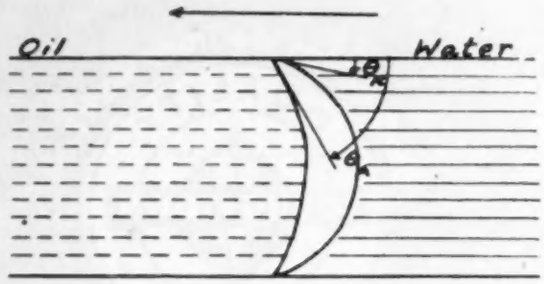
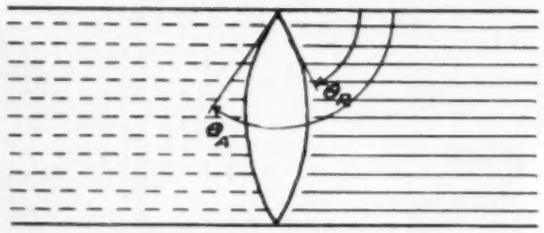


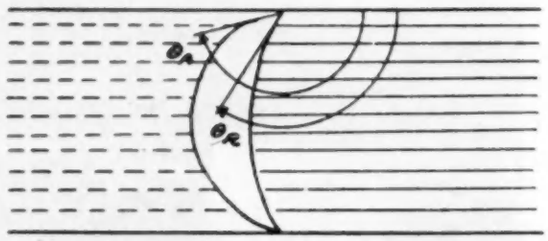
a. Both θ^A_{SWO} and $\theta^R_{SWO} < 90°$

Water will displace oil.



b. $\theta^A_{SWO} > 90°$; $\theta^R_{SWO} < 90°$

Neither liquid will displace the other



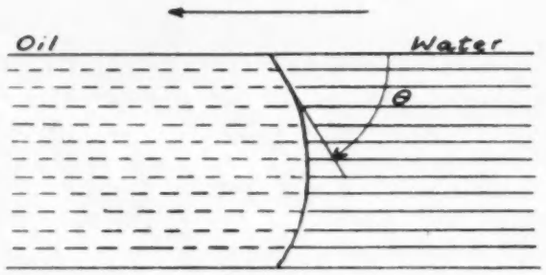
c. Both θ^A_{SWO} and $\theta^R_{SWO} > 90°$

Oil will displace water.

Arrows indicate direction of spontaneous displacement.

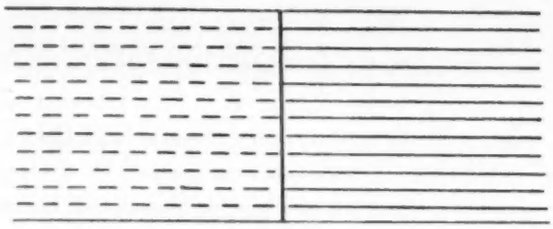
FIGURE 2

Diagram of Angles of Contact between a Solid and Pairs of Reservoir Fluids Indicative of Preferential Wettability (after Benner, Dodd, and Bartell).



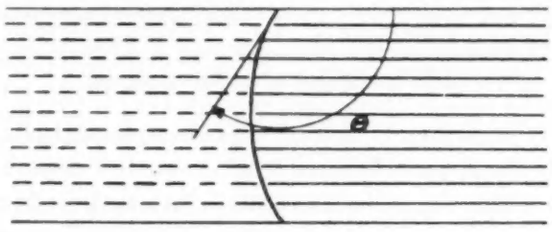
a $\theta < 90°$

Water will displace oil.



b $\theta = 90°$

Neither liquid will displace the other.



c. $\theta > 90°$

Oil will displace water.

Arrows indicate direction of spontaneous displacement.

FIGURE 3

Diagram of Advancing and Receding Angles of Contact between a Solid and Pairs of Reservoir Fluids Indicative of Preferential Wettability (after Benner, Dodd, and Bartell).

in the smallest capillary pores, is a question which properly can be left for other discussion. However, it can be appreciated readily that, if the former condition exists in the reservoir, the problem of displacement of the oil by water is further complicated—it having been shown by the University of Michigan research[3] that the water-advancing angle formed when the water-oil interface is caused to move over a surface originally in contact with oil, θ^A_{swo}, is often different from the water-receding angle formed when the water-oil interface is caused to move over a surface originally in contact with water, θ^R_{swo}. As shown in Figure 3, if the two angles, although different, are both less than 90 degrees, the water will wet the reservoir mineral, and will displace the oil. If both angles should exceed 90 degrees (a condition so far undiscovered), the oil would wet preferentially the reservoir mineral and displace water. If the two angles are so different that one is less than 90 degrees and the other greater than 90 degrees, a condition which has been found to exist rather frequently, there would be no spontaneous displacing movement of one fluid to the other, and displacement of the reservoir contents could only be effected by the application of pressure sufficient to force fluid movement. However, it is believed, for any given system, that the displacement of oil by water may be effected more easily than the displacement of water by oil if the difference between 90 degrees and the value of the receding angle is greater than the difference between 90 degrees and the value of the advancing angle, i.e.:

90 deg—$\theta^R_{swo} > \theta^A_{swo}$—90 deg.

Thus, for example, a favorable situation for water flooding should exist where θ^R_{swo}=45 degrees and θ^A_{swo}=120 degrees, and an unfavorable situation should exist where θ^R_{swo}=65 degrees and θ^A_{swo}=120 degrees. In the former situation, lower pressures should be necessary to

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initiate displacement than in the latter. It has been noted that a large percentage of the crudes tested[3] possessed advancing interfacial contact angles greater than 90 degrees. This is believed to be due to surface-active compounds which become absorbed at the interfaces and thus alter the surface of the reservoir rock, causing it to be hydrophobic and, in consequence, preventing the complete displacement of oil by water. Excepting the oil which may become trapped in disconnected pores, the residual oil, after water flooding (for which no method of recovery has been devised), may remain as an adhering film to the reservoir mineral grains held securely thereto by the surface-active compounds adsorbed, possibly in layers of molecular thickness at the point of contact.

It is recognized that the information so far developed on surface-tension effects is not sufficiently detailed or complete to enable prediction of the degree of success that may be expected from water-flooding operations in previously untested fields or areas, assuming the favorable determination of other important factors. However, there is justification for believing that an encouraging approach to the solution of the problem has been provided by the studies of interfacial contact angles described herein. It is so evident that the relations already established may be some of the controlling criteria determining the success of water flooding that additional and more comprehensive research certainly is desirable.

Although water flooding under certain conditions has been demonstrated to be more effective in the recovery of oil than repressuring by air or gas injection, there is usually a greater percentage of the residual-oil content of the reservoir, after the primary-recovery phase, left in the reservoir after water flooding than is recovered by this secondary method. In large fields, such as Bradford and Allegany, this unrecovered oil amounts to hundreds of millions of barrels. The lenticularity of individual beds in the reservoir undoubtedly causes the trapping of some oil in the area between the injection and producing wells. Nevertheless, cores taken from sand sections, where it is known that water has migrated freely for many years, still show an appreciable oil content. This remaining oil, unrecoverable by any known process, is a challenging problem for study by physical chemists. If it could be produced along with the normal secondary recovery, the augmented production would permit the profitable application of secondary-recovery methods in many fields where it is not economically feasible under existing price schedules, thereby adding substantially to the proven oil reserves of the United States. A better understanding of surface-tension effects in artificial water flooding might point the way to the recovery of enormous quantities of oil.

REFERENCES

[1] Frank C. Benner, Wesley W. Riches, and F. E. Bartell. "Nature and Importance of Surface Forces in Production of Petroleum," *Drilling and Production Practice*, 442, American Petroleum Institute, New York (1938).

[2] F. C. Benner and F. E. Bartell, "The Effect of Polar Impurities upon Capillary and Surface Phenomena in Petroleum Production," *Drilling and Production Practice*, 341 (1941).

[3] Frank C. Benner, Charles G. Dodd, and F. E. Bartell, "Evaluation of Effective Displacement Pressures for Petroleum Oil-Water Silica Systems," *Drilling and Production Practice*, 169 (1942).

[4] F. E. Bartell and F. L. Miller, *Ind. Eng. Chem.* 20, 738 (1928).

Florida Looms As Area for Future Exploration

■ CONTINUED FROM PAGE 11

The Miami area includes those counties on the southeastern part of the mainland of the peninsula from Melbourne south: Indian River, St. Lucie, Martin, Palm Beach, Broward, Dade and part of Monroe and Collier counties. The surface formations in the north are Pleistocene shell marls. In the south the Miami oolite outcrops over a large area from the vicinity of Boynton to the end of the mainland. In the extreme north part of the area, the Ocala limestone probably lies at a depth of around 300 feet below sea level, dipping south and southeast until at Fort Pierce it is found at a depth of 670 feet below sea level.

Little is known about the Key West area. Subsurface conditions on the keys are partially known to a depth of 2555 feet by wells drilled at Marathon and Key West.

Since most of the above data was published a few deep wells have been drilled which gives more information about scattered areas. Until Humble Oil & Refining Company completed its deep wildcat in Collier County, the record depth was held by Peninsular Oil & Refining Company's Cory 1 in Monroe County, which was abandoned in 1939 at 10,006 feet.

Until hundreds of additional wildcats are drilled, accurate subsurface geology on Florida remains fragmentary and confined to the shallower formations. If present leasing and exploration are indications, this data will be rapidly accumulated within a few years.

Against a background of Humble Oil & Refining Company's discovery, a number of companies are presently engaged in widespread leasing. Approximately 7,500,000 acres already have been leased. These plays are not specifically confined to any one spot, although the north part of the state and the south central portion are drawing most attention. Major leaseholders, besides Humble Oil & Refining Company are The Pure Oil Company, Sun Oil Company, Gulf Oil Corporation, Sinclair Prairie Oil Company, The California Company and H. L. Hunt.

The bulk of acreage is leased for 10 cents per acre bonus and 10 cents per acre rentals. Hundreds of thousands of acres, some in big blocks, were leased for 5 cents bonus and 5 cents rental; however, 10 cents per acre is the prevailing price. Attesting the growing interest, one Houston operator offered $109,000 for a lease on 1,091,855 acres of state-owned land in the Everglades near the Humble discovery.

With one well definitely proving that the state has oil possibilities, and with operators becoming interested in the area as holding future reserves, Florida may be the next state to enter the list of active petroleum provinces.

REFERENCES

Florida State Geological Survey, 17th Annual Report.

"Petroleum in United States and Possessions," by Arnold and Kemnitzer.

"Possible Future Oil Provinces of the United States and Canada," A.A.P.G.

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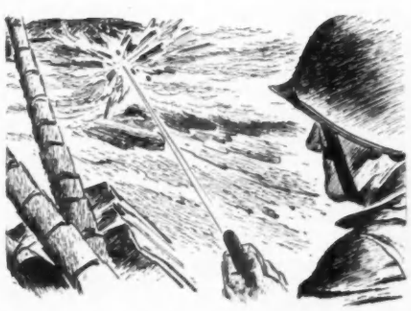

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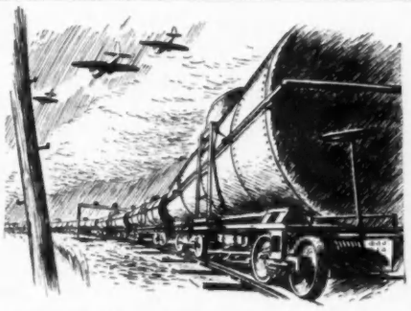

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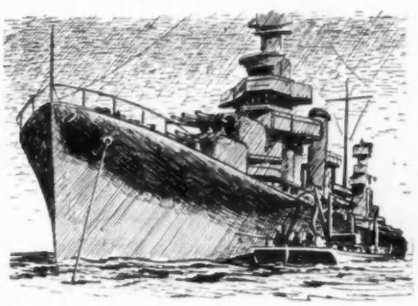

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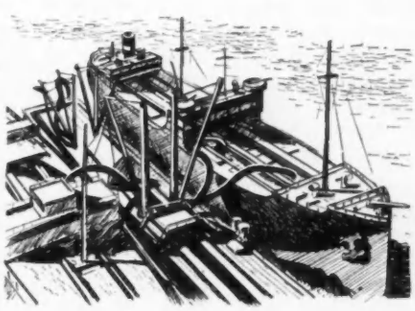

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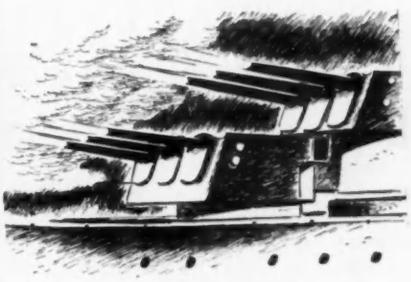

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Relationships Between Price, Exploration Activity and Petroleum Discovery Volume

PART 1

By E. E. ROSAIRE, Subterrex, Houston, Texas

INCREASING restrictions on the civilian consumption of gasoline and other petroleum products, together with verbal and published assurances from industry and government sources, indicate that the current and future petroleum demands will at least equal and probably soon surpass the current optimum efficient producibility of the continental United States.

The associated implications have been described in magnitude over the range from "emergency" to "crisis," and in time from "imminent" to "current." Various methods of alleviation have been proposed, including stimulation of discovery rates, further cuts in civilian consumption, and increased imports or their equivalents, i.e., greater use of production and refining facilities from sources outside the United States. With respect to the relative importance of these possible courses of action, the following can be said.

The writer considers it axiomatic that, once a satisfactory working inventory has been warehoused, and in the face of an increasing rate of consumption, the *minimum* goal should be that the average annual increment to warehouse stock should equal the average annual withdrawals. Since the indications are that the optimum efficient production rate has been reached in almost if not all the major producing provinces of the continental United States, one must conclude that the nation's working inventory is not unduly large, so that our minimum goal for average annual discovery volume should be the replacement of the average annual production.

Were the current discovery rate running well above that figure, there would be no cause for alarm, even in an economy straight-jacketed by war-imposed restrictions. However, for the past several years, the annual discovery volume has been declining. Though some disagreement exists as to whether it still approximates or actually is well below the annual production, there is no question that, if the recognized decline continues in the face of current and anticipated withdrawals, the industry's warehouse stock will decrease materially because of inadequate annual replacements. Further, official information is to the effect that the rate of withdrawal is to be increased rather than decreased, so that there remains little question as to whether the future requires an increase in annual discovery rates. Again, then, we come back to the advisability of setting as a *minimum* goal the average annual replacement, by discovery, of the average annual production.

Of the various methods proposed for stimulating the discovery rate, that which has received the greatest publicity is the recommendation for an increase in the price of crude oil.* Among the advocates are not only technicians and executives from within and without the petroleum industry, but also newspaper editors, government executives, administrators and men in public office. The tenor of the recommendations run all the way from vociferous insistence that otherwise public scandal is threatened to modest suggestions that an improvement in the discovery rate might follow if the price of crude oil were raised.

Pros and Cons

The following quotations are typical of the latter class of recommendations:

"Crude oil prices have increased over recent years, but the rise has been moderate and further increase is required if oil-finding activity is to be stimulated—if it is desired to increase discoveries in the years 1943 to 1945, the price stimulus ought to be applied now."[1]

"It would be impossible to predict what success would be realized in finding oil if more favorable factors, such as higher prices or lower taxes, were put into effect, but experience has proved that such a stimulus would increase discoveries."[2]

". . . higher prices or tax abatement measures could stimulate discovery and producibility, but there has been a long delay in invoking these developments."[3]

That the question is moot is illustrated by the following statements, typical of the negative:

"No discussion of the principal factors influencing discovery rates would be complete without examining the effect or influence of price. Chart II shows by three year running averages the relationship between average crude oil price, dry holes drilled, and discoveries from the entire United States for the period from 1900 to 1942. This chart shows a generally direct relationship between the average crude oil price, dry holes drilled (a measure of finding effort), and discoveries, but in recent years, with which we are principally concerned, this direct relationship fails to maintain itself."[4]

"Thus discovery, the objective of all exploration, is a function not merely of the volume of effort going into this enterprise, which varies with the price level, but is strongly influenced by the technical skill utilized in locating and drilling wildcat wells and, for the short term at least, by the element of pure chance. Hence we find an all too imperfect conformance between rate of discovery and price of crude oil. Table 2 shows, for periods from the inception of the industry to the present, the rate of crude oil discovery in comparison with the price of crude oil and the rate of search (as indicated by the number of dry holes). It will be noticed at once that the volume of discovery has not been proportional to price and that the oil found per dry hole drilled has displayed a sharp upward trend in the past

*Various reasons have been advanced for increasing the price of crude oil. In addition to a possible increase in discovery rates, these are for furthering secondary recovery, maintaining the operation of marginal stripper wells, keeping independent operators in business, etc. In the study which follows, however, only the first mentioned (stimulation of discovery rates) is under examination.

[1] Wallace Pratt. "Oil Discovery Rate Three Years Hence Depends on Price of Crude Oil Now." Mining and Metallurgy, pp. 349-351, July, 1941.

[2] Harry C. Weiss. "Crisis in Oil?", Mining and Metallurgy, pp. 388-391. September, 1943.

[3] Joseph E. Pogue, "International Aspects of the American Petroleum Industry," The Oil Weekly, p. 28, September 27, 1943.

[4] L. F. McCollum, "Some Factors Influencing Declining Rate of Crude Oil Discoveries, etc." Bull. A. A. P. G. pp. 960-969, Vol. 27, No. 7, July, 1943.

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Table 1

YEAR	Discovery Volume (Billions of Barrels) rD	Dry Holes (Thousands of Wells) rW	Price (Dollars per Barrel) rP	Well Success Factor (Million Barrels per Well) rWSF
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1902	.325	3.400	.80	.096
1903	.225	3.700	.85	.061
1904	.225	3.775	.80	.060
1905	.375	3.800	.70	.099
1906	.375	3.700	.65	.101
1907	.375	3.500	.70	.107
1908	.375	3.425	.65	.109
1909	.450	3.100	.65	.145
1910	.375	2.800	.60	.134
1911	.450	2.575	.60	.175
1912	.525	3.100	.70	.169
1913	.550	3.700	.85	.150
1914	.425	3.700	.80	.115
1915	.325	3.700	.85	.088
1916	.450	3.900	1.22	.115
1917	.425	4.800	1.53	.089
1918	.575	5.500	1.85	.103
1919	.650	6.300	2.35	.103
1920	1.000	6.200	2.25	.161
1921	1.125	6.100	2.15	.182
1922	1.125	5.500	1.65	.204
1923	.825	5.425	1.45	.154
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1929	3.300 (1.600)	7.225	1.20	.451 (.221)†
1930	3.200 (1.500)	6.200	1.05	.516 (.242)†
1931	2.650 (.950)	4.875	.85	.545 (.195)†
1932	.825	3.525	.70	.232
1933	.875	3.725	.82	.234
1934	1.350	4.225	.90	.320
1935	1.800	4.825	1.00	.374
1936	1.925	5.525	1.05	.348
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15 years in undoubted response to advances in technology."[5]

"The fact is that the price control of petroleum production is so remote that it scarcely deserves consideration in a study of this sort and that no stated price schedule can be depended upon to produce a required increase in production in a given time. The following facts are believed to substantiate this statement.

"In the past the price of crude petroleum has risen at the first definite indication of shortage and has remained high until the difficulties of storing the excess production caused a reduction in price. In several cases the momentum of new development, and the fact that petroleum can be produced from flush fields so much more cheaply than the average cost for all fields, have kept production rising rapidly in the face of rapidly falling prices.

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"The rapidly increasing prices from 1919 to 1920 did not bring about an increase of production in the old producing states of New York, Pennsylvania, Ohio, West Virginia, Illinois and Indiana, but their combined production was about 15,000,000 barrels less in 1920 than in 1915. This fact leads to a very obvious conclusion, but one which is often overlooked, that increased prices do not bring about increased production from areas which are 'worked out' for new fields."[6]

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If data like these can be used qualitatively as source material for generalizations, their more quantitative study is justified, not only to check the validity of those generalizations, but also to analyze more fully just what actually has transpired.

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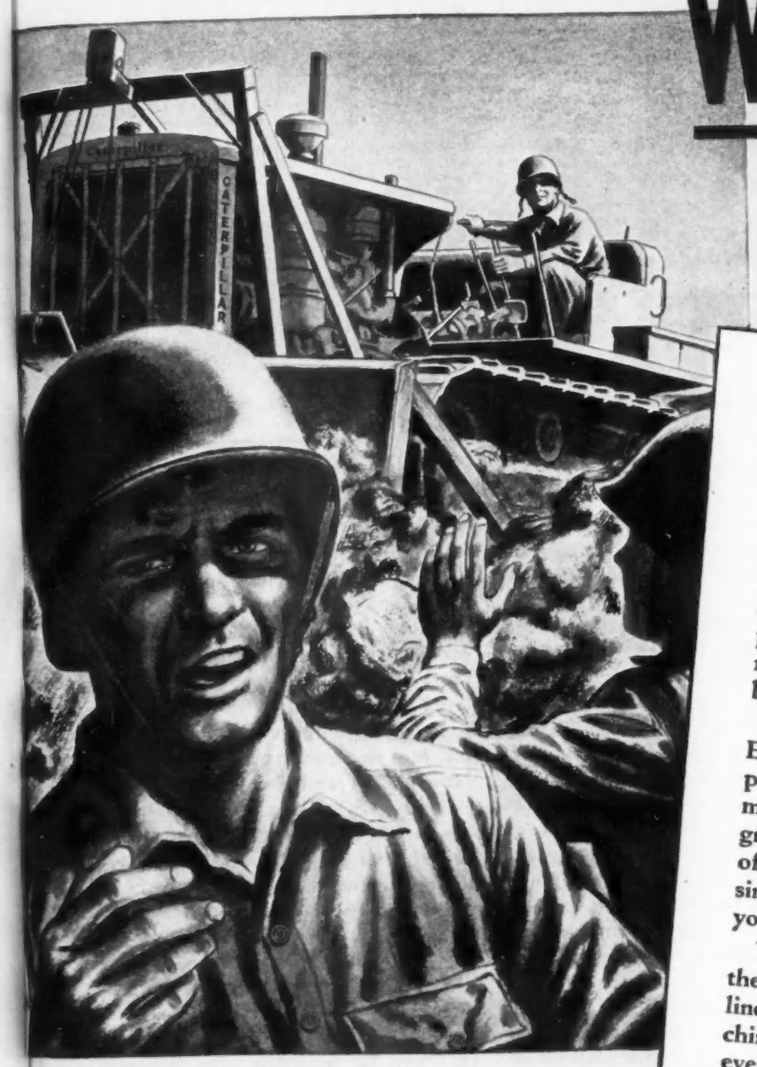

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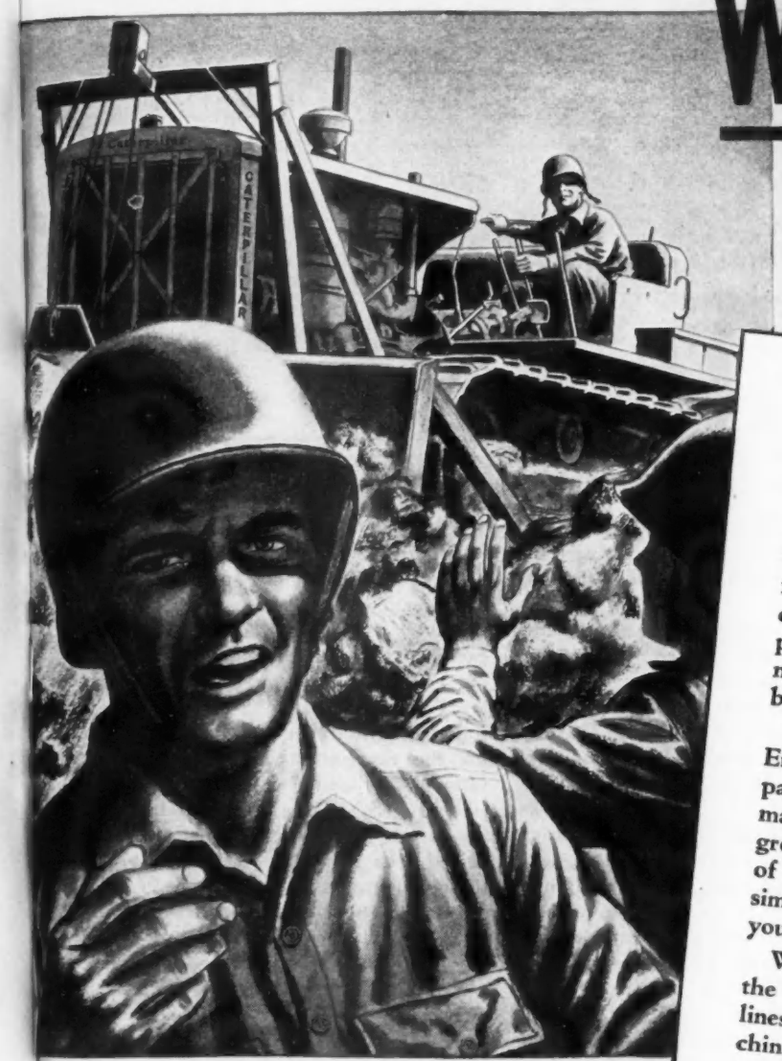

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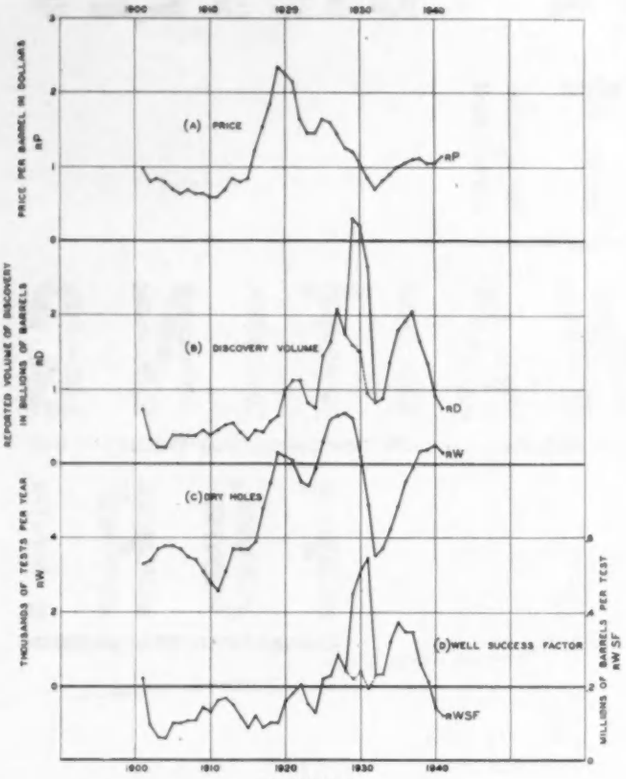

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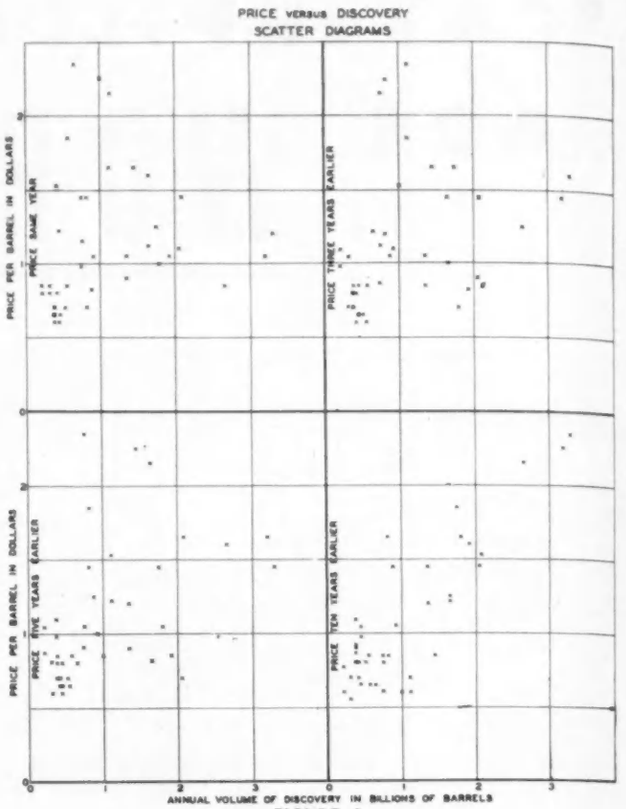
PRICE versus DISCOVERY
SCATTER DIAGRAMS
PRICE PER BARREL IN DOLLARS
PRICE SAME YEAR
PRICE THREE YEARS EARLIER
PRICE FIVE YEARS EARLIER
PRICE TEN YEARS EARLIER
ANNUAL VOLUME OF DISCOVERY IN BILLIONS OF BARRELS

FIGURE 2

discovery volume (D) is expressed in billions of barrels, the price (P) in dollars per barrel, and the wells (W) in thousands of wells. Since the source material (McCollum's data) are in running three-year averages, that will hold for the data used hereafter, and will be implicit in all manipulations made and conclusions drawn.

Figure 1 then corresponds to McCollum's Chart II with the addition of a plot for the reported Well Success Factor (rWSF).

In order to recognize possible relationships between price and discovery volume, the following investigation was made.

The reported discovery volumes (rD) were plotted first, against the reported prices (rP) of the same year, and then against the reported prices of the succeeding 25 and the preceding 10 years. A series of "scatter diagrams" resulted, some of which are shown in Figure 2, on which possible linear relationships would be indicated by a tendency of the plotted points on any particular diagram to fall along a straight line.

In order to facilitate the recognition and comparison of relationships indicated on these scatter diagrams, each set of such data (rD lagging and leading rP) was analyzed by a recognized statistical method (the Product Moment Method) which resulted in numerical values for the Correlation Coefficient (r), the Mean Error (E_r), the Line of Regression (equation expressing the linear relationship) and the Standard Error of Estimate (S_y).

In order to recognize relationships which may have existed earlier but which are not apparent today, this lead-lag analysis was also carried out for the first 12, 15, 18, 21, 24, 27, 30, 33, 36, and 39 years of the total 41 years of data available from McCollum's Chart II.

Thus the process of examination was to slide the annual chart of discovery volume (first in toto and then in segments) back and forth along the annual chart of price, in much the same fashion that well strips, electric logs and seismic records are examined for possible relationships in every day practice. In the case of the studies hereinafter described, however, a numerical analysis was used as a measure of correlation instead of the simpler visual inspection relied upon in the more familiar cases cited.

Since the maximum number of years used in this study (41) gave a number of cases which was "small" when considered from a statistical viewpoint, and since the other spreads involved still smaller numbers of years, question could be raised as to the merit of the correlation coefficient (r) when considered by itself. Therefore, the index of merit considered was the ratio of the correlation coefficient (r) to its mean error (E_r), for which latter the standard formula is

$$E_r = \frac{1 - r^2}{\sqrt{N}}$$

where N is the number of cases.[1]

In Figure 3, this ratio (r/E_r) is plotted, for the various spreads of years mentioned earlier, against the years of discovery leading and lagging price. For each case where a prominent peak occurred, the line of regression was calculated and its equation shown in Figure 3 together with the corresponding values for the correlation coefficient (r), the ratio (r/E_r) and the standard error of estimate (S_y). (The subscript indicates the earlier price year established by the peak in the plot of the ratio (r/E_r) for the given spread.) The standard error of estimate is the average (quadratic mean) of the deviations about the line of regression. One (S_y) measured off plus and minus about the line of regression includes 68 percent of the cases for a normal distribution of error, so that (S_y) can be regarded as a measure of fit between the actual values and those calculated from the line of regression.

Returning to the consideration of Figure 3, a peak is shown at discovery volume lagging price by 1.5 years in the spreads 1901-1921 and 1901-1924. Although this same correlation is suggested in the following 1901-1927 spread, the outstanding feature there is a broad hump at 6-7-8 years lag. In all of the succeeding spreads, the dominant feature is a prominent peak at discovery volume lagging price by 10 years.

With a view to investigating further the hump at 6-7-8 years lag in the 1901-1927 spread, the data for that and the

[1] N. R. Campbell. "An Account of the Principals of Measurement and Calculation," p. 192, Longmans Green and Co. Ltd., 1928.

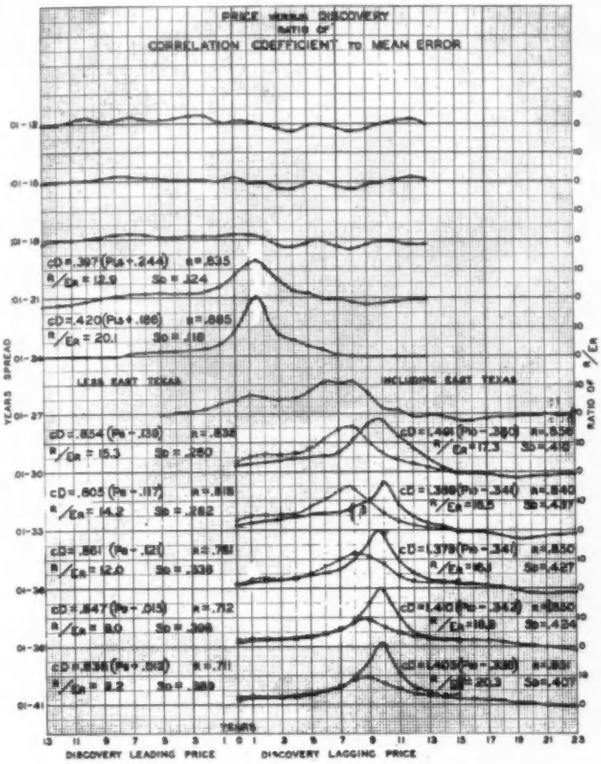

FIGURE 3

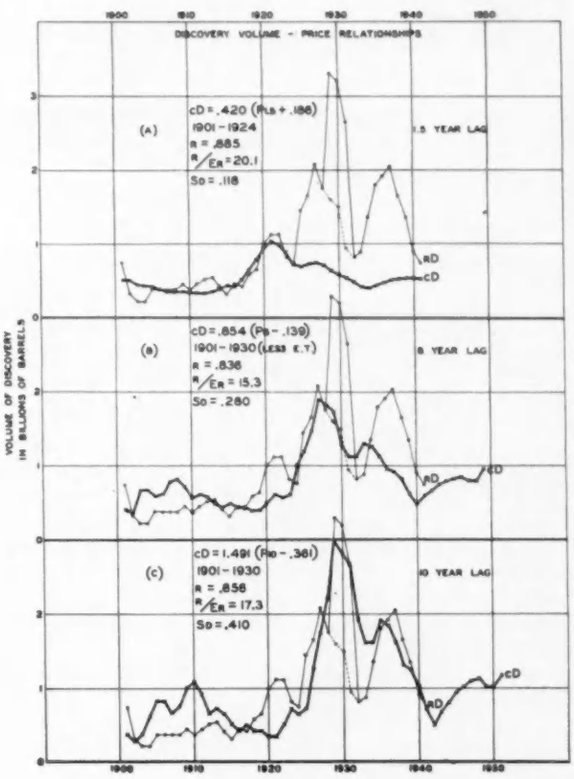

FIGURE 4

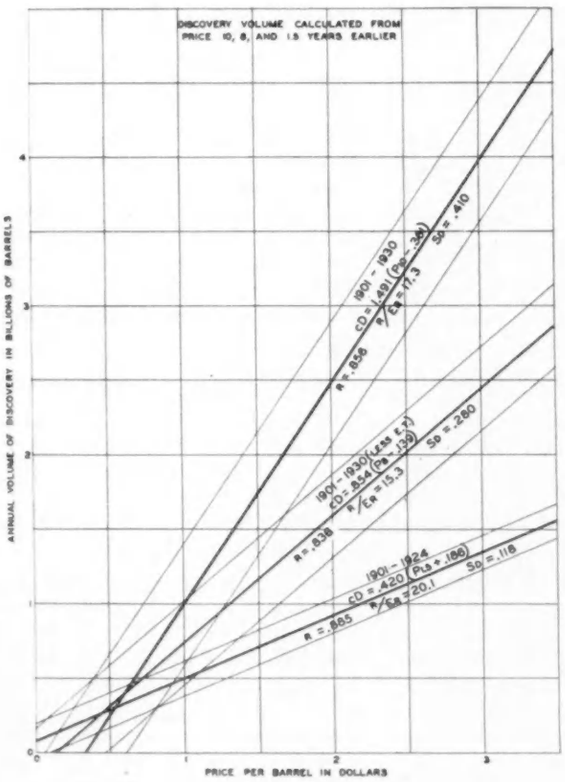
DISCOVERY VOLUME CALCULATED FROM PRICE 10, 5, AND 1.5 YEARS EARLIER
ANNUAL VOLUME OF DISCOVERY IN BILLIONS OF BARRELS
PRICE PER BARREL IN DOLLARS

FIGURE 5

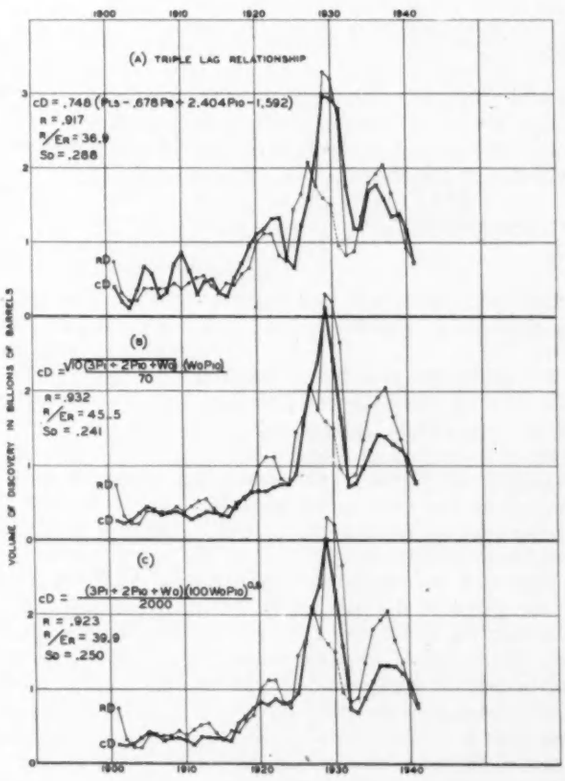

FIGURE 6

TABLE 2
Overall Performance, 1901-1941

Discovery Volume (Billion Barrels)			Activity (Wells) (Thousands of Wells)			Well Success Factor (Million Barrels per Well)	
rD	42.7	100.0%	rW	200.9	100.0%	rWSF	.21
cD	22.6	53.6%	cW	166.2	82.7%	cWSF	.14
pD	20.1	46.7%	pW	34.7	17.3%	pWSF	.58
						pWSF/cWSF= .58/.14=4.3	

TABLE 2a

Discovery Volume (Billion Barrels)			Activity (Wells) (Thousands of Wells)			Well Success Factor (Million Barrels per Well)	
pD′	15.0	35.0%	pW	34.7	17.3%	pWSF′	.43
						pWSF′/cWSF= .43/.14=3.1	

following spreads were corrected for the 5.1 billion barrels of the East Texas oil field by subtracting 1.7 billion barrels from the running three-year averages of the discovery volumes reported for 1929, 1930 and 1931. The ratio (r/E_r) was then recalculated, and the resulting values are shown in Figure 3 by the dotted lines for those spreads. The results show that, had it not been for the discovery of that giant pool in 1930, a peak at 7-8 years lag would have developed in the 1901-1930 spread and persisted as shown, diminishing in magnitude and drifting in position to about an 8.5 year lag in the following spreads.

Figure 4 shows the reported discovery volumes (rD) in comparison with those calculated (cD) from the lines of regression established by the peaks in Figure 3 for 1.5, 8 and 10 year lags in the 1901-1924, 1901-1930 and 1901-1930 spreads, respectively.

The following conclusions are obvious.

1. For the earlier years, the best fit results from the use of the 1.5 year lag relationship. (This agrees with McCollum's conclusion to the effect that a direct relationship held in the earlier years.)

2. For the period 1924-1930 (omitting the East Texas field), the best fit results from the use of the 8-year lag relationship.

3. For the period 1924-1941 (including the East Texas field), the best fit results from the use of the 10-year lag relationship.

Inspection of Figure 1 indicates that the net effect has been to correlate the 1921 price peak successively with the discovery volume peaks at 1921-1922, 1927 and 1929-1930. As would be expected from the shape of the maxima in these two curves, no correlation is shown in Figure 3 for a lag of 16 years, in which the price peak at 1921 would be shifted for comparison with the latest discovery volume peak at 1937.

Figure 5 shows a comparison of the lines of regression for these three linear relationships.

The next step was to investigate the possibility of multiple relationships. One of these, obviously, was the use of these three periods of lag in a single equation, and was done by the use of least squares and all 41 points. Figure 6a shows a comparison between the reported discovery volumes and those calculated from that "triple lag" equation. Of the several other multiple relationships determined, the two best (from the standpoint of fit) are shown in Figures 6b and 6c.

Triple-Lag Relationship

Of the four relationships recognized between discovery volume and price alone, the "triple lag" is most interesting from an empirical standpoint in view of its showing the best fit over the longest spread of years.

However, a very complex effect of price on discovery volume is indicated by this triple-lag relationship. Not only is the price effect delayed for three periods of irregular length (1.5, 8 and 10 years), but also, after a 1.5-year delayed appearance in one direction, it incubates for 6.5 years more to appear, though diminished, in the opposite direction. Then, after an additional incubation period of about two more years, it explodes in the original direction with more than twice its original effect. To say the least, such is delayed action of a most complex sort, for which there is no ready explanation in terms of the obvious characteristics of the prospecting phase of the petroleum industry. Until some rational explanation is presented for this complex delayed action, the triple-lag relationship must be regarded as of only empirical importance.

Other Multiple Relationships

An interested colleague investigated the possibilities of multiple relationships based upon the effect of price and activity as indicated by the number of dry holes. Several were developed, and the two best, as indicated by the closeness of fit, are shown in Figures 6b and 6c. His comments were as follows:

"The equations were adjusted to the data, and it is obvious that this adjustment permitted the fixing of the coefficients for P_1, P_{10} and W_0. In other words, no more than 3 points on the 1901-1941 discovery volume chart in Figure 1 were used in the determination of these coefficients. The two best fits were obtained with the equations plotted in Figures 6b and 6c, and there compared with the reported discovery volumes. The agreement between reported and calculated values is fair.

"These equations raise interesting implications. For example, they suggest that the discovery of the East Texas oil field was 'in the cards,' i.e., a sound basis for that discovery may have been laid in the price structure of the preceding years. Expressed in other words, the industry would have failed to find the reserves to which it was entitled if that discovery had not been made—or other discoveries of about the same total volume.

"No claim is made that these equations are the best obtainable to fit the reported data. Caution is warranted in their use, especially in extrapolating into the future. They are presented here for their possible, perhaps only academic, interest. In them are condensed the industry's oil-finding history; the prices and the wells involved appear to have determined discoveries to the extent that the inventory would be substantially where it is, and what it is, if the calculated rather than the reported discovery volumes had been found. Perhaps the agreement with the reported data is accidental; perhaps the discovery of the East Texas oil field was accidental."

With these comments, the writer is in agreement. However, these multiple relationships are complex and not subject to ready interpretation in terms of actual prospecting practice. Since they do not lend themselves readily to long range prediction, their usefulness remains limited until they prove to be capable of readier analysis, which might well be possible if they were developed in other forms.

Linear Relationships

In the case of the three simpler, linear relationships, it is possible to discuss their possible significance in terms of recognized prospecting practice, as follows:

10-Year Lag Relationship: Of the three linear relationships recognized between price and discovery volume, that involving a 10-year lag is most intriguing. Thus, had it been recognized in 1932 following a study of this sort (as it could have been), it might have been used to make a reasonably satisfactory prediction as to the discovery volume 10 years in advance, i.e., up to the present time, making use of the data then at hand.

'On the basis of the past fair agree-

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ment for the 18 years from 1923-1941, there exists a natural temptation to predict the discovery volume for the next 10 years from the same relationship, as shown by the projection of cD to 1951 in Figure 4c.

However, there is no rational, obvious explanation for this 10-year lag in terms of ordinary prospecting practice. True, 10-year lease terms are rather frequent, and it is obvious that such practice would introduce a lag approximating 10 years between initial activity and discovery, particularly when the lease play is based on "checkerboarding." Just such a lag appears to have taken place in West Texas in the recent past. In other areas, however, recent discovery (as in the Gulf Coast) has followed much more closely upon exploration.

There are other objections to relying upon the empirical importance of the 10-year lag. Thus, it fails to show satisfactory agreement over the period 1901-1921, when, it is generally agreed, the effect of price was quite prominent. Finally, the 10-year lag is a sterile conception, imposing upon a volatile industry the dogma that only one control, price, is at hand, and that having adjusted price, we then can only wait for 10 years before its effect can be observed.

Eight-Year Lag Relationship: Much the same comments can be made with respect to the 8-year lag, and, since it is almost completely hidden unless the volume of the East Texas field is taken out, it merits less consideration than the 10-year lag relationship.

Year and a Half Lag Relationship: The over-all considerations involved in the 1.5-year lag indicate that it is, by far, the most reasonable from the standpoint of actual exploration practice.

Thus, a time lag of 1.5 years between cause and effect is neither too long nor too short, in terms of known prospecting practice. Again, this relationship shows a satisfactory fit over the period 1901-1924, for the greater part of which, at least, there exists general agreement to the effect that then price was the the dominant factor. Also, this 1.5-year lag relationship does show a satisfactory fit over and past that part of the 41-year period during which the maximum range in price (running 3-year averages) took place, i.e., from before the low of $0.60 in 1910-1911 to beyond the high of $2.35 in 1919.

Therefore, of these various empirically established relationships between price and discovery volume, that involving a 1.5-year lag appears to be the one with most in its favor. There still remains, however, the necessity of accounting for its failure to fit over the later years, a point which will be developed later.

[To be concluded next week.]

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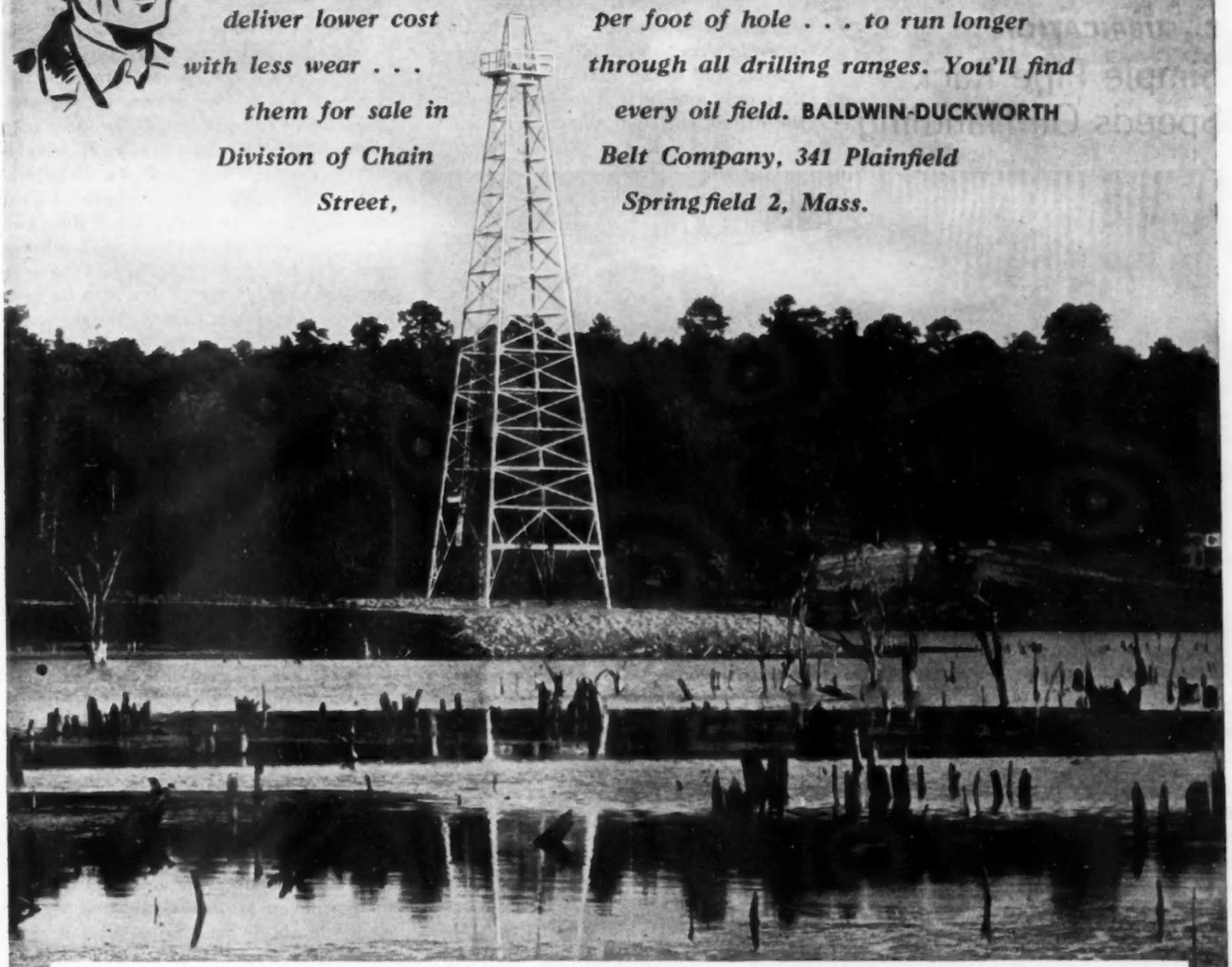

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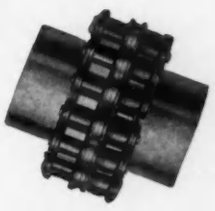

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PRACTICAL OPERATING *Hints* FOR THE DRILLING RIG

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1. LUBRICATION

Simple Pipe Rack Speeds Oil Handling

capable of supporting the weight of six or eight drums. In addition to the easy-loading and draining features is the fact that only one man can easily roll out the drums and spot them on the rack.

A pair of heavy pipe sections, supported so the outer joint is lower than the rear member, provides automatic drainage toward spigot, while front pipe restrains lower hoop of drum.

AS LONG as there are drilling rigs there will be new and novel methods devised for care and handling of fuel and lubricating oil drums. None, however, could be simpler, yet as nearly fool-proof and efficient as the rack currently used by one operator for multiple drum storage.

Built at convenient truck-bed height, the rack consists merely of two horizontal pipe bars approximately 30 inches apart, but with the outer bar set some 6 or 8 inches lower than the other. The rack abuts against and is placed end toward the truck-loading platform beside the rig, and as barrels are rolled onto it, they automatically assume an inclined position, ready for immediate use, and in a position which practically insures draining all the fluid without tilting. The slope of the rack is just great enough to permit draining the drums, yet not enough to cause them to slip off. As shown in the photograph, the construction of the drum sides is such that they would not slip off without someone actually shoving them off.

Made of used 3-inch tubing, the rack is well braced underneath and is easily

2. MUD LINES

Flexible Suspension Sidesteps Vibration

INSTEAD of trying to anchor mud pump lines to prevent destructive vibration caused by the pulsation of the pumps, a solution may lie in using a flexible hose and supporting it in such a way that vibration may continue, but with no damage to either the line or surrounding equipment.

One superintendent operating a light portable drilling rig accomplished this, and is saving considerable time in rigging-up and tearing down, by suspending the flexible pump connection to a special free-swinging cradle. A snugly-fitting clamp was made by longitudinally splitting a 12-inch length of light casing, then re-assembling the two halves, providing one side with a hinge and the other with a pair of ears to make a sturdy clamp that can be kept in position at any desired point on the hose.

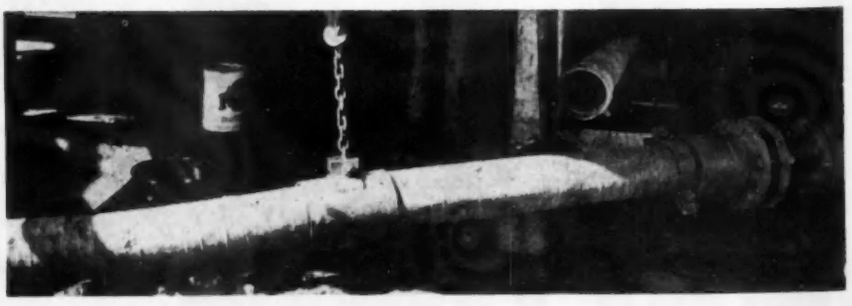
After the clamp is securely tightened, a chain loop fastened to the bolt clamping the two cradle halves together is looped over some convenient overhead fitting or floor joist. Involving no critical materials and being inexpensive to build, this type of support is applicable to light rigs and portable units where mud pressures are not excessive.

3. STARTING UNITS

One Battery Serves Dual Engine Set-Up

THE starting battery is an item of equipment which is used infrequently, but which is a necessity when the drilling engine is to be put into service. One contractor reduces the amount of equipment upkeep at his mechanical rig by wiring a single battery so that it may be used for either of two adjacent starting motors.

The battery is set between the engines, with the supporting base welded to the transverse skid member on which both units are carried. One circuit from the battery carries through the usual switch to the motor, one lead being



Cutting a section of flexible tubing into the mud line, and supporting it with chain from pivotal point, permits the unit to absorb pump pound and protect fixed portion of mud line.

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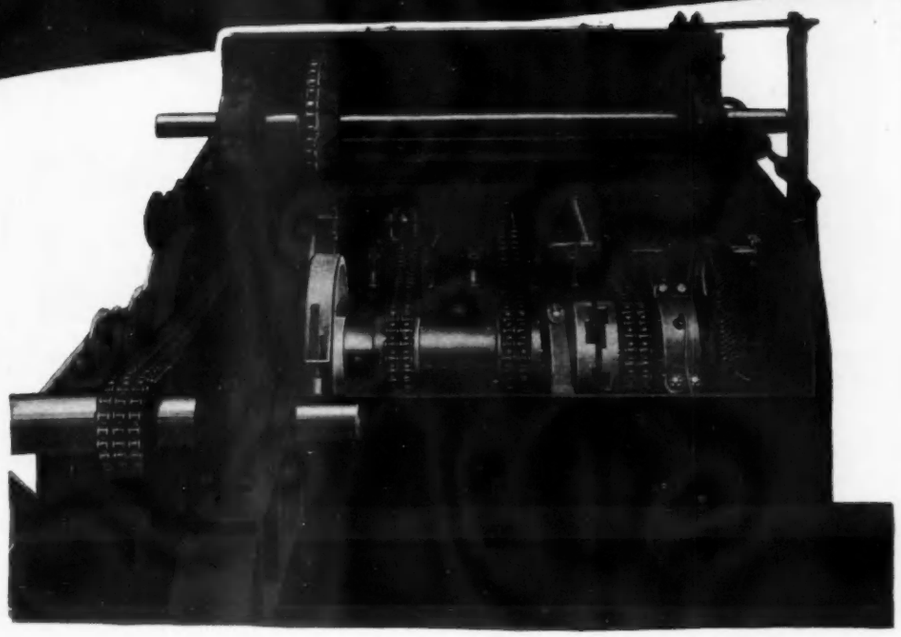

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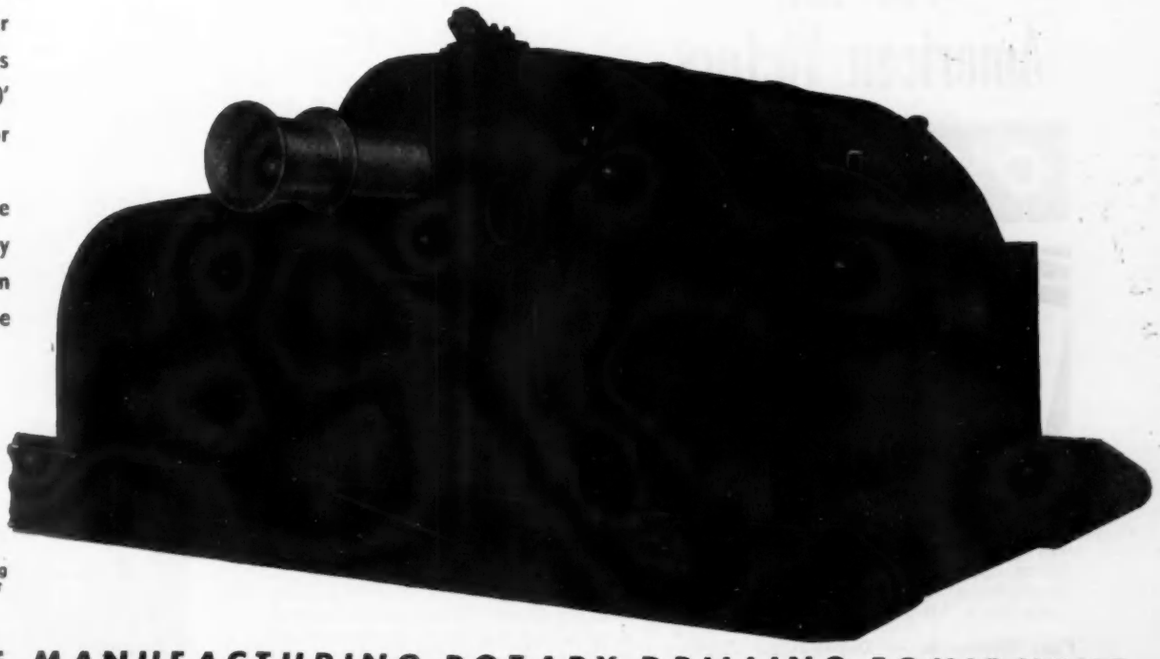

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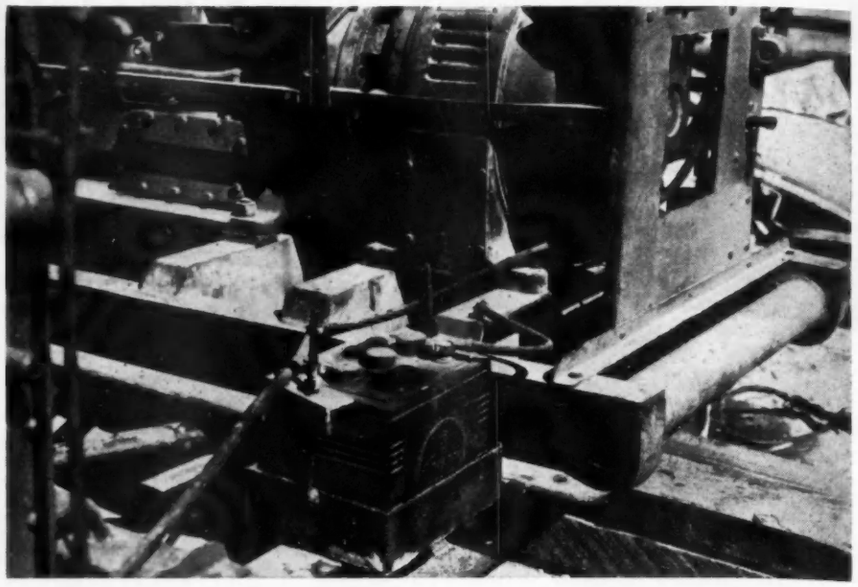

Single battery, grounded to supporting skid on which both engines are mounted, provides starting current to either starting motor, while being kept charged by generator on one engine.

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grounded to the supporting frame. The other lead carries a clip at the central point, each end being strung to the proper starting motor.

By throwing the starting switch on one motor, only the circuit applying to that unit is energized, the other branch remaining open and thus drawing no current from the battery.

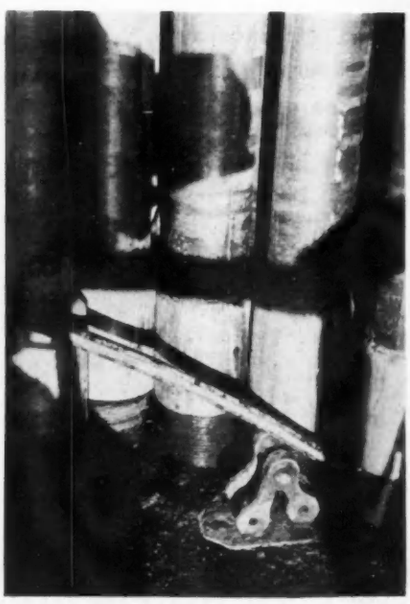
Where both units are operated alternately, instead of one being held over considerable periods as emergency stand-by, but one generator is required, the unit carrying the generator being operated long enough to maintain full charge in the battery. Even when starting a cold engine, the current draft, though high during actual spinning of the unit, is not enough to injure the battery.

4. *PIPE HANDLING*

Chain-Link Fulcrum Speeds Stand Racking

IT FREQUENTLY becomes necessary to shift several stands of drill pipe, particularly following a fast job of coming out of the hole. Ordinarily, this shifting is done with a crowbar or pinch bar of some sort, with the wedge end prying between the bottom of the pipe and the floor. This is often unsatisfactory as the wet flooring "gives" and the drill pipe moves but a very short distance.

To eliminate much of this trouble, the welder of one company devised a little tool which has since repaid its worth many times over. It consists of a small fulcrum made from two links salvaged from a rotary chain. As shown in the photograph, the links are folded back to form an "A" shape and the two legs then welded to a small flat steel base. Any desired height of the fulcrum may be obtained by spreading the two ends of the link outward before welding them into place, but the one shown is set at approximately the correct angle to obtain the height permitting a bar being placed under the shoulder of a tool joint. The device speeds up and simplifies the work of shifting the heavy stands of pipe, and at the same time it permits moving the pipe a greater distance with each "bite" of the bar, without having the bar sink into the soft flooring.



Support made from welding chain to base plate affords proper setting for best bar leverage.

☆ ☆ ☆ ☆ WASHINGTON ROUNDUP ☆ ☆ ☆ ☆

SUBMISSION to Congress by President Roosevelt of a report on lend-lease operations in which the Middle East oil situation was dealt with exhaustively was the outstanding oil development in an otherwise quiet holiday week.

In that report, showing lend-lease exports of $608,000,000 worth of oil and products from March, 1941, to October 31, last, was given the first comprehensive exposition of the part oil is playing in the lend-lease and military programs of the Allied Nations, apparently to rebut charges that the British failed to furnish a proper share of the oil needed for the war.

Of considerable significance was the intimation in the report that oil resources in other parts of the world are to be expanded as rapidly as possible, both for immediate and post-war requirements, and a reference to the master lend-lease agreement with England, which provides, it was pointed out, for "the expansion of production, the elimination of discriminatory treatment in commerce, the reduction of trade barriers" to assure all nations their fair share of the oil produced in all parts of the world.

During the week, the Office of Defense Transportation challenged the "complacency" with which some in the oil and railroad industries view the transportation situation as a result of the completion of the big-inch pipe line, and warned that the country is facing another transportation crisis.

The warning came as the government took over the railroads, but had no relation to that action, the primary causes of the threatened emergency being failure of shippers and receivers to handle oil rapidly, the slowing down of symbol-train movement by the railroads, and the lack of repair parts and tires which is taking an increasing number of tank trucks off the highways.

Ickes Says PAW Positively Will Close Up After War

PAW definitely will close up shop and go out of the oil business at the expiration of the war emergency and no thought is being given to continuance of federal control of the industry, Administrator Ickes said December 30.

Questioned as to whether his recent statement that he would work with the oil industry to restore it "so far as possible to ante-bellum competitive status" involved the possibility of continued regulation, Ickes answered with a flat "no", adding that he plans to close out PAW as soon as possible.

The administrator, however, was less direct in answering a similar question as to the future of Petroleum Reserves Corporation, saying that PRC has nothing to do with domestic oil matters and that, so far as operations abroad are concerned, "We don't know yet; that is all so inchoate that I can not say."

There were indications however that PRC is still thinking in international terms, Ickes and Col. James F. Drake president of the Gulf Oil Corporation having spent nearly an hour at the White House with President Roosevelt during the week. Ickes refused to say what was under discussion or to admit that the conversation involved the Kuwait fields.

Commenting on another angle of the foreign oil situation, Ickes said he had no opinion to offer on the recent report of the foreign operations committee explaining that it was a "volunteer" report.

"I had not asked anyone for a report; I didn't know anyone was working on a report. They just came in and handed it to me one day," he said.

"I didn't think it called for comment."

Ickes touched upon other phases of the oil situation at this final press conference of the year saying that plans were being made for wildcatting in Alaska as disclosed before a Senate committee last month by War Department officials and that a contract will be let to a drilling outfit for driving the wells, on which up to $5,500,000 will be spent with a view to determining the possibilities of the territory.

The administrator indicated that he has abandoned attempts to carry out instructions of Economic Stabilization Director Fred M. Vinson to develop a substitute for a crude price increase explaining that he could not "invent a substitute that would take care of the situation and prove an incentive to greater exploration without raising the price of crude."

He said that a letter to that effect was sent to Vinson "several weeks ago" and that he had heard nothing since "that I recall."

Ickes Says PAW Positively Will Close Up After War

»

Lend-Lease Report Shows U. S. Biggest User of Oil

»

ODT Sees Probable Crisis in Oil Transportation

»

Big Inch Throughput Cut Down by Bad Weather

»

By B. F. LINZ,
Washington Correspondent

☆ ☆ ☆ ☆

President's Report on Oil Lend-Lease Shows United States Biggest User in War

Petroleum products valued at $608,000,000 were shipped to our fighting allies under lend-lease from March, 1941, through October, 1943, Congress was told last week by President Roosevelt in the most comprehensive report on lend-lease activities so far released.

Most of the lend-lease oil products, $423,000,000 worth, went to the United Kingdom, but Russia got $27,000,000 worth, and $61,000,000 worth went to Africa, the Middle East and the Mediterranean area, and another $97,000,000 worth went to China, India, Australia and New Zealand, the report showed.

Incorporated in the report was an extensive discussion of lend-lease petroleum in the war, in which it was pointed out that the United States is actually exporting now to all countries a smaller quantity of petroleum products than was shipped abroad before the war, with about 90 percent of all the oil we produce being used for our own war industry and armed forces.

"Our allies are also making the most effective possible use of their own petroleum production and refining facilities—limited though these are as compared with our own," Congress was told. "A substantial part of the overseas petroleum requirements of the United States naval, air and ground forces, and merchant marine is supplied by our allies under reverse lend-lease.

"With the petroleum products we have sent under lend-lease we have added immeasurably to the striking power of the United Nations as a whole. The air assault from the United Kingdom on Nazi Europe, the Soviet victories over the Nazi army and the Allied campaign against Japan in the Pacific have all been greatly aided by lend-lease supplies of gasoline, oil and lubricants."

Supporting the contention that we are exporting less oil than before the war, the report cites the 1938 experience, showing a crude production of 1,214,000,000 barrels and exports of 216,000,000 barrels, or 18 percent, while for 1943 production is estimated at 1,500,000,000 barrels and all exports at 139,000,000 barrels, or 9 percent.

"As the above table shows," it was

pointed out, "the additional production of crude petroleum in the United States since the outbreak of the war and the curtailment of nonessential civilian demands have not been caused by lend-lease consumption of United States petroleum products. They are the result, instead, of the large demands upon domestic petroleum production of our own war industries and of our own armed forces in this country and abroad. In fact, a substantial part of the petroleum products shown as lend-lease exports are returned to our armed forces abroad, in addition to the large quantities of petroleum products which our allies furnish our armed forces under reverse lend-lease from their own petroleum resources."

Middle East Ahead of Prewar

Meeting charges that the British have not furnished as much oil as they might from their Middle East reserves, the report declared that production in that area "has already surpassed the level of pre-war production, and current production is greatly in excess of the production of two years ago when the whole area was threatened with the danger of falling under Nazi control.

British corporations in the Middle East control many times the production and refining capacity controlled by United States corporations in that area and are consequently supplying many times the quantity of petroleum products supplied from oil resources in that area controlled by United States interests," it was asserted.

"All petroleum refining facilities in the Middle East, as elsewhere, are being utilized to the fullest extent consistent with the efficient use of tankers and the maximum output of those petroleum products that are most needed for fighting the war. For example, the great refinery at Abadan at the head of the Persian Gulf is currently operating at its top output under these conditions. This refinery, owned by a British corporation, is by far the largest refinery in the Middle East and has been the only United Nations source of aviation gasoline in that part of the world. The aviation-gasoline plant at Abadan is operating at its full capacity with its present equipment. Its output of aviation gasoline has already been more than doubled and is being further increased to several times the pre-war output by the provision of additional equipment."

Not Enough Tankers

The supply of tankers, it was explained, has been inadequate to transport to areas where they are needed for war purposes the entire output of heavier products necessarily produced in the aviation gasoline manufacturing process. This surplus of heavier products at Abadan, which currently amounts to as much as 50,000 barrels daily, has been too large to be held in storage, and it has been disposed of by pumping it back to the oil fields in Iran.

"Although this situation was, from a commercial standpoint, both wasteful and costly to the British," the report commented, "it saved space on tankers that were needed to carry aviation gasoline and high-octane motor gasoline to American and British forces.

"The British government, which has had a substantial military-supply responsibility in the Middle East, has not hesitated to expand the petroleum facilities in that area," the President continued. "The first stage of the expansion of the aviation-gasoline facilities of the Abadan refinery was begun in the fall of 1941 and the expansion is continuing. The capacity of the British-controlled refinery at Haifa is also being expanded and the refinery at Suez has been operated at full capacity throughout the period of active warfare in this area. The entire expansion of aviation gasoline and basic facilities at Abadan is being paid for by the British. It has not been carried out with lend-lease funds."

Mr. Roosevelt also disclosed that a project has been undertaken to construct an aviation gasoline plant and to expand the basic facilities of the refinery at Bahrein, halfway down the Persian Gulf. This refinery is owned by United States corporations and equipment supplied from this country for the project is being paid for by the companies with the assistance of a loan from the Defense Supplies Corporation.

Reverse Lend-Lease

The United States, with minor exceptions, does not pay for products currently obtained from the Middle East, it was explained. Practically all bunker oil for our naval and merchant vessels in the Middle East is provided by the British government under reverse lend-lease, and products of all types shipped from the Middle East refineries to Australia, India, South Africa and in the Mediterranean area are furnished locally to our armed forces and merchant vessels in the same manner.

"The effective war use of the combined petroleum resources of the United Nations has been primarily determined by the supply of tankers and other forms of transportation to carry the refined petroleum products to war theaters," the report pointed out. "Many ocean and overland routes have been cut off completely and other routes are highly dangerous.

"There has been a critically short supply of tankers available to the United Nations in relation to the needed quantities of petroleum products and the long distances over which it was necessary to haul these products from the refineries to the war theatres. United States- and British-controlled trankers have been jointly programmed to maintain the most efficient operation and eliminate cross hauls. The critical shortage in tankers has made it imperative, in order to maintain the maximum supply of petroleum products going into theaters of operations, that the shortest haul be used wherever possible. In addition, the United States has thereby gained tankers for essential domestic use.

Short Haul Rules

"Ever since the beginning of lend-lease, the 'short haul' principle has governed shipments of petroleum products to the Southwest Pacific except where emergency and strategic developments have necessitated departures from that principle. Petroleum products for Eastern Australia and New Zealand have generally been supplied under lend-lease from the West Coast of the United States and Peru, because these were the shortest routes. United Nations naval, air and ground forces in Western Australia, the Indian Ocean area and the Eastern Mediterranean have depended upon supplies of petroleum products from the refineries in the Middle East. The only petroleum products customarily shipped to these areas from the United States have been products such as high-grade lubricants, which are not produced in substantial quantities outside of the United States, and aviation gasoline when the output at Abadan was not sufficient to meet all needs."

The Allied campaign in French North Africa was supplied primarily from the Western Hemisphere because this was the shortest sea route so long as the Mediterranean was closed to Allied shipping. During the coming year, however, a major part of the oil needs will probably be supplied from British sources in the Middle East.

Shipments to England

The United Kingdom has been the war theater to which the greatest quantities of oil products are supplied under lend-lease. Tankers could not be spared to make the long voyage to the United Kingdom from the Persian Gulf refineries via the Cape of Good Hope, which is about four times as long as the route from the United States to England, or through the Mediterranean, which is about twice as long, it was explained.

Most of the products used by the Soviet forces are from Russian sources, but certain vitally needed products were not refined in sufficient quantities in the U.S.S.R. and have been supplied by the United States under lend-lease, it was stated. Several refinery units have been sent to the Soviet Union to enable Russia to increase its production of aviation gasoline and other high-grade products from its own resources, and the Soviet Union also has received products from the British by way of the difficult rail-truck-sea route from the Persian Gulf refineries.

Bigger Need in 1944

"Every effort is being made to increase the crude-oil production, the refining capacity and the supply of tankers available to the United Nations," Congress was assured. "The over-all petroleum war needs of the United Nations in 1944 will rise above what they are now as the magnitude of our offensive increases. The increasing numbers of planes, ships and tanks which we are now producing and putting into action against the enemy require increasing quantities of gasoline, oil and lubricants.

"Additional supplies of petroleum products from other areas will not therefore result in a corresponding reduction in the demands on our own petroleum resources. All available supplies of petroleum products will be required for a speedy and complete victory of the United Nations over the enemy. In the future, as in the past, the petroleum resources of each of the United Nations will be utilized in its own direct war effort and the combined war effort, in proportion to the maximum ability of each to produce and efficiently deliver the petroleum products needed in the prosecution of the war.

"After the war the nations of the world, including the United States, will require petroleum to maintain their industralized economies. As in the case of other natural resources, some nations will have insufficient oil reserves to meet

their petroleum requirements. Others will have a surplus. Agreed action by the nations of the world, in the master lend-lease agreements, for the expansion of production, the elimination of discriminatory treatment in commerce, and the reduction of trade barriers will assure the United States and other nations their fair share of the petroleum produced in all parts of the world."

North Africa

The report also answered allegations that oil shipped to French North Africa had been distributed among the natives, pointing out that the area is virtually 100 percent dependent on imports for its supply of petroleum products and that, when the country was invaded, "it was a military and lend-lease problem of the first magnitude to supply all of the oil and gasoline which was urgently needed and to restrict its use to essential military purposes."

"All petroleum products in French North Africa are, and have been, under strict military control," it was asserted. Upon arrival there, it was explained, the products are allocated by the Allied headquarters to the several military and civilian uses strictly on the basis of need, with civilian needs having the lowest priority. Under the arrangements now in effect, the French pay in dollars for all of the products delivered for civilian use.

In the first eight months of 1943, approximately 140,000 barrels of gasoline was allocated for essential civilian services in Morocco, Algeria and Tunisia, none for pleasure driving or other non-essential services, it was stated.

"On the average, the report said, "less gasoline has been provided for the few private cars permitted to operate in French North Africa for such essential purposes as doctors' calls than is permitted to A-card holders in this country. A large number of the private cars in North Africa have been requisitioned by the military authorities for the use of Allied military personnel. Since these cars in many cases are not clearly marked as military vehicles they may lead a casual observer to believe that more cars are using gasoline for civilian purposes than is the fact."

Transportation Crisis Looms As Result of Complacency

Domestic oil transportation is pictured by Defense Transportation officials as facing another crisis, due in part to complacency following the completion of the Big-Inch pipe line and in part to a growing shortage of parts for the repair of tank trucks.

A warning that there must be no let-down in the effort to move oil competently was issued by ODT following a meeting of its tank-car committee at which it developed that shippers and receivers feel that the supply of tank cars is getting easier, with the result that they are not loading and unloading them as promptly as they should, and that this feeling is spreading to the railroads, with the result that many of the symbol trains are operating considerably behind schedule.

Despite the completion of Big-Inch and the near completion of Little-Big-Inch, ODT officials said, changing domestic conditions make it imperative that there be no let-down in the transportation effort. The three factors which are operating to increase the complexity of the situation, they said, are: A disposition among the shippers, receivers and the railroads to assume that the tank-car situation is easing; the shifting of tank cars from symbol routes to many smaller runs in all parts of the country, and the serious situation in over-the-road tank-truck transportation due to a severe shortage of heavy-duty tires and repair parts, the obsolescence of equipment and the shortage of manpower.

"With the coming of freezing weather in the unloading territory and the increased loading of all commodities, the shippers and the railroads must be constantly on the alert to speed up the loading, unloading and moving of tank cars," it was warned.

ODT explained that as fast as tank cars have been released from the Norris City pool, as a result of the completion of Big-Inch, they are being shifted to other movements, and at the present time no cars are being used to transport crude oil from the Norris City terminals and the cars released have been absorbed in other areas.

Officials based their belief that shippers feel that the car situation has eased on the recently increased demand for tank-car permits for movements under 200 miles, but they admitted that the increasing number of tank trucks laid up for lack of parts or tires is a contributing factor to that increase.

Reports to the tank-truck section show that in some sections of the country as many as 20 percent of the tank trucks are tied up because of a shortage of either tires or parts, they said, and there is reason to fear that unless replacement equipment is made available in the very near future the number of trucks taken out of service may mount to 30 percent.

To meet this situation, ODT is working with the Army and the War Production Board to provide the necessary parts and tires, and in extreme cases, it was disclosed, the Army has drawn on its supply of tires and parts to restore to service some trucks which carry oil and gasoline to Army air fields.

Big Inch Schedule Lower in Bad Months

Operation of the Big-Inch pipe line at its capacity level of 300,000 barrels daily in January but at 10,000 barrels less during February and March, when the most severe operating conditions of the winter are expected, has been scheduled by PAW.

The definite schedule for January calls for the movement of 9,300,000 barrels of crude oil, 4,513,600 of it from East Texas, 1,469,400 from Southwest Texas and 3,317,000 from West Texas, while tentative schedules for the following two months call for 8,410,000 barrels in February and 8,990,000 in March, the former including 4,060,000 barrels from East Texas, 1,450,000 from Southwest Texas and 2,900,000 from West Texas, and the latter for 4,340,000 barrels from East Texas, 1,550,000 from Southwest Texas and 3,100,000 from West Texas.

PAW also has scheduled the deliveries to be made to War Emergency Pipelines, Inc., at Longview, programming sales to the line by producers as follows:

January. East Texas oil: The Atlantic Refining Company, 511,500 barrels; Central Pipe Line Company, 31,000 barrels; Cities Service Oil Company, 291,400 barrels; Gulf Refining Company, 68,200 barrels; Humble Oil & Refining Company, 1,075,700 barrels; Magnolia Petroleum Company, 124,000 barrels; The Pure Oil Company, 248,000 barrels; Shell Oil Company, 409,200 barrels; Sinclair Prairie Oil Marketing Company, 272,800 barrels; Sun Oil Company, 945,500 barrels; Tide Water Associated Oil Company, 536,300 barrels; Southwest Texas: The Atlantic Refining Company, 235,600 barrels; Globe Oil & Refining Company, 49,600 barrels; Houston Oil Company, 43,400 barrels; Humble Oil & Refining Company, 713,000 barrels; Magnolia Petroleum Company, 279,000 barrels; Sun Oil Company, 148,800 barrels; West Texas: The Atlantic Refining Company, 1,085,000 barrels; Gulf Refining Company, 217,000 barrels; Humble Oil & Refining Company, 2,015,000 barrels.

February. East Texas Oil: The Atlantic Refining Company, 522,000 barrels; Central Pipe Line Company, 29,000 barrels; Gulf Refining Company, 60,900 barrels; Humble Oil & Refining Company, 936,700 barrels; Magnolia Petroleum Company, 133,400 barrels; The Pure Oil Company, 232,000 barrels; Shell Oil Company, 411,800 barrels; Sinclair Prairie Oil Marketing Company, 278,400 barrels; Sun Oil Company, 904,800 barrels; Tide Water Associated Oil Company, 551,000 barrels; Southwest Texas: Globe Oil & Refining Company, 342,200 barrels; Houston Oil Company, 40,600 barrels; Humble Oil & Refining Company, 725,000 barrels; Magnolia Petroleum Company, 232,000 barrels; Sun Oil Company, 110,200 barrels; West Texas: The Atlantic Refining Company, 1,015,000 barrels; Humble Oil & Refining Company, 1,885,000 barrels.

March. East Texas oil: The Atlantic Refining Company, 558,000 barrels; Central Pipe Line Company, 31,000 barrels; Gulf Refining Company, 65,100 barrels; Humble Oil & Refining Company, 1,001,300 barrels; Magnolia Petroleum Company, 142,600 barrels; The Pure Oil Company, 248,000 barrels; Shell Oil Company, 440,200 barrels; Sinclair Prairie Oil Marketing Company, 297,600 barrels; Sun Oil Company, 967,200 barrels; Tide Water Associated Oil Company, 589,000 barrels; Southwest Texas: Globe Oil & Refining Company, 365,800 barrels; Houston Oil Company, 43,400 barrels; Humble Oil & Refining Company, 775,000 barrels; Magnolia Petroleum Company, 248,000 barrels; Sun Oil Company, 117,800 barrels; West Texas: The Atlantic Refining Company, 1,085,000 barrels; Humble Oil & Refining Company, 2,015,000 barrels.

Cut Kerosine Quality To Get More Volume

Working to expand the production of kerosine for the East Coast market, PAW on December 27 announced relaxation of the straight specifications formerly in effect and ordered the stabilization of kerosine and distillate fuel oil quality on a basis "that will permit greater refinery yields of kerosine without, however, impairing the quality of

the products to any noticeable degree so far as heating and lighting efficiency is concerned."

It was explained by Ickes that the relatively easier situation now prevailing with respect to the lighter fuel oils warrants the change in order to maintain kerosine supply at its present "satisfactory, though tight" level. He further defended the cut by pointing out that "over the years of peacetime marketing, under the normal processes of competitive selling, the quality of kerosine was raised to a point far in excess of the normal minimum commercial requirements for the product."

It was stated that the present level of Kerosine supply is adequate to meet rationed needs on the East Coast, but that the situation is very tight and it is considered advisable to expand the supply as greatly as possible, to avoid a repetition of the very serious situation which occurred last winter, when New England was threatened with a kerosine famine and it was necessary to rush supplies in in drums by rail.

East Coast Oil Inventories Best Since Pearl Harbor

East Coast oil inventories are in better shape than at any time since the outbreak of the war as indicated by PAW's weekly stock report on Christmas Day. It was shown that total stocks were 65,263,000 barrels, increasing from 63,600,000 barrels during the week and were slightly above 50 percent of normal or almost twice what they were on May 8, last, when the low point of 25.5 percent was touched.

The report showed that while stocks of residual fuel oil dropped during the week ended December 25 from 66.9 to 67.7 percent, those of gasoline increased from 42.4 to 43.2 percent, kerosine from 51.4 to 52.9 percent and light heating oils from 75 to 80 percent.

Streamlining PAW Part of New Year Program

The New Year found PAW in streamlined form following a shake-up which consolidated the supply and transportation divisions and expanded the marketing division to take in distribution, the two to be known probably as the "Transportation and Supply" and "Marketing and Distribution" divisions.

The changes also involved the disbanding of the supply and distribution subcommittees with appreciation to their members for the services rendered, and the re-aligning of the marketing and transportation district committees to conform to the new set-up in Washington.

The general and affected functional committees have been asked to nominate members for the marketing and distribution and transportation and supply committees which are to be set up, keeping them, however, within the established twelve-member limitation.

As reorganized, the new marketing and distribution division and district committees will have responsibility for distribution from terminal supply points to the consumer and the transportation and supply division and committees will handle the oil movement to and including delivery to terminal points.

The changes were made to meet criticisms from the industry over the operations of the supply and distribution subcommittees which were charged with having acted in some instances in an arbitrary manner, occasionally without notification to Washington until after action had been taken.

Expect No Gasoline Ration Change This Quarter

Last of the half-million new passenger automobiles which were frozen by the government when production was halted two years ago will be on the road before early summer, and from then on the automotive transportation situation will become progressively more serious, it was warned December 28 by Price Administrator Chester Bowles.

Only 60,000 cars — about five days' supply in normal times—now remain in dealers' hands, about enough to carry through to the end of April with strict economy in their distribution, Bowles said.

"As cars wear out we are all going to face a serious situation on automotive transportation," he said. "During the last two years more than 3,000,000 passenger cars have been wrecked or become worn out beyond repair, with few replacements available. The number will increase at a constantly more rapid rate as the war goes on."

Bowles expressed the belief that in most sections of the country present gasoline-coupon values will be maintained during the first quarter of 1944 despite a cut by PAW in the gasoline quota, but he warned that 36 percent of all our gasoline now is being used for military purposes and 40 percent will be required this year.

Fuel oil and kerosine coupon values also will be maintained through January, he said.

Pressure Off on Extreme-Pressure Lubricants

Restrictions on the manufacture and sale of extreme-pressure lubricants, imposed by PAW on April 20, 1942, through recommendation No. 40, which limited production to 75 percent of 1942 output, have been revoked and manufacturers and distributors are relieved of the necessity of maintaining records of sales to civilians.

The limitation provisions were designed to overcome a shortage of chemicals used in the manufacture of additives for such lubricants. In recent weeks the supply of additives has become more than adequate for all requirements, largely as a result of gasoline rationing, which has brought about a substantial decline in civilian demand for extreme-pressure lubricants.

However, PAW warned, manufacturers and distributors should continue their conservation of additive materials against future wartime emergencies.

Scouts Plan Meeting At Dallas April 24-25

The National Oil Scouts and Landmen's Association will hold its annual meeting April 24 and 25 at Dallas, according to Dell J. Crosby, president. Directors, representing eight of the district branches of the association, voted to streamline the meeting to business sessions and to restrict attendance by having the district bodies designate delegates to elect new officers. The business sessions will be held in the Adolphus Hotel. The board made arrangements for the publication of the association's annual review book on 1943 oil activities in all producing states. The directors meeting was attended by Crosby, C. H. Ervin, P. Wayne Ferguson, Tom Hill, H. L. Johns, H. F. King, W. L. Miller, H. D. Robertson and Tom Weigel.

Dallas Geologists Name Committee for Annual Meet

The American Association of Petroleum Geologists has announced committees to handle local arrangements in connection with the annual meeting of the association, at the Baker Hotel, Dallas, March 21, 22 and 23. All are Dallas residents.

Dr. F. H. Lahee, chief geologist of Sun Oil Company, is chairman of the technical program committee. S. A. Thompson, Magnolia Petroleum Company, is co-chairman.

General chairman of local arrangements is Joseph M. Wilson. Other committees include:

Technical arrangements, Charles B. Carpenter, chairman, W. W. Newton, M. D. McCarty, C. V. A. Pittman and Barney Fisher;

Hotels and housing, Eugene McDermott, chairman, Raymond A. Stehr, Martin C. Kelsey, J. H. Pernell, Morris G. Spencer, James A. Lewis, Melvin A. Garrett and George B. Rice;

Registration, Lewis MacNaughton, chairman, Richard T. Bright, R. I. Seale, R. B. Gilmore and W. G. Meyer;

Reception, Dilworth S. Hager, chairman, Russell S. McFarland, Ellis W. Shuler, J. C. Karcher, E. B. Germany, Angus McLeod and Heath M. Robinson;

Educational exhibits, Edgar Kraus, chairman, Henry J. Morgan, Jr., and Wallace Ralston;

Finance, H. C. Vanderpool, Fred E. Joekel and O. E. Walton;

Publicity, J. Edward Morrow, chairman, Joseph M. Wilson and Henry C. Cortes;

Publications, S. M. Aronson, chairman, H. B. Hill, W. J. Jackson, P. W. McFarland and K. C. Sclater.

Oil and Gas Lectures To Be Held in Houston

The South Texas School of Law's ninth annual series of oil and gas lectures, will be offered from January 13 to April 27, at Houston Y. M. C. A.

Instruction is given along practical, non-technical lines on such phases of the industry as leases, royalties, operating agreements, governmental regulations and operating rights.

The course consists of 16 lectures and is open to both men and women. Subject of the first talk to be given on January 13, from 8 to 10 p.m. will be "The Geology of Oil and Gas," by Morgan J. Davis, geologist for Humble Oil & Refining Company. Subsequent speakers include, Judge E. E. Townes, former vice president and general counsel of Humble Oil & Refining Company; James L. Shepherd, Baker, Botts, Andrews and Wharton; Herman P. Pressler, Humble Oil & Refining Company; T. J. Lawhon, The Texas Company; A. W. Bounds, Stanolind Oil & Gas Company; and J. Q. Weatherly, Humble Oil & Refining Company.

H. C. DAVIS, geologist for Lone Star Gas Company, Dallas, has resigned to join the geological staff of The Texas Company at Wichita, Kansas.

Production of Major Products Larger, But Residual Output Still Inadequate

Refineries of the United States stepped up crude runs to stills by 39,000 barrels daily in the week ended December 25, with the result that production of all of the principal products increased, making possible a normal seasonal accumulation of gasoline in storage and a slowing down of previous heavy withdrawals of heating oil and residual fuel oil from storage.

The draft on light fuel oil stocks was not abnormal for this cold season, but the continued withdrawal from already inadequate residual fuel stocks, following former heavy and uninterrupted drafts, was an unfavorable development, despite the lowered rate of drawing on the stocks. These trends were revealed in the latest weekly statistics compiled by the American Petroleum Institute.

Crude oil production averaged 4,363,000 barrels per day in the week ended December 25, down by the insignificant amount of 1000 barrels daily. The output was 484,000 barrels a day or 12.4 percent greater than that in the corresponding week a year before. California and states of the Southwest account for the increased production.

Crude runs to stills averaged 4,185,000 barrels daily in the week of December 25, up 39,000 from the week before and in excess of the runs a year earlier by 677,000 barrels daily or over 19 percent.

Stocks of crude oil in the nation were increased 1,647,000 barrels during the week ended December 18, the Bureau of Mines reported. They rose to 241,795,000 barrels and then were 8,568,000 barrels or nearly 4 percent above the level of 233,227,000 barrels reported for December 19 a year ago.

Production of gasoline totaled 12,597,000 barrels in the 7 days ended December 25, an average of 1,799,000 barrels daily, the output having been greater than in the previous week by 51,000 barrels daily and greater than in the corresponding week a year earlier by about 365,000 barrels daily or 25 percent.

Stocks of finished and unfinished gasoline in the United States were increased in the week ended December 25 by 1,299,000 barrels or an average of 185,000 barrels daily. Having totaled 74,024,000 barrels at the end of the week, they were, however, 3,757,000 barrels or nearly 5 percent under the level at which they stood a year previously.

Refinery output of gas oil and distillate fuel totaled 4,457,000 barrels in the week of December 25, an average of 636,000 barrels daily. The production was 10,000 barrels a day greater than in the previous week and 54,000 daily or 9 percent greater than in the like week a year previously.

U. S. stocks of gasoil and distillate were drawn upon to the extent of 46,000

Crude Oil Production in the United States

(Estimates compiled by The OIL WEEKLY. All figures indicate daily averages, in barrels)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED January 1	December 25
Arkansas	79,200	78,200
California	801,100	804,050
Long Beach	30,500	30,500
Midway-Sunset	56,050	55,550
Kettleman Hills	42,750	42,300
Wilmington	97,650	97,600
Rest of State	574,150	578,100
Colorado	6,900	6,550
Illinois	220,000	222,550
Salem	29,000	29,100
Louden	35,000	35,300
Other New Pools	144,200	146,350
Old Pools	11,800	11,800
Indiana	13,250	11,850
Kansas	274,000	268,300
Kentucky	22,000	21,000
Louisiana	353,550	353,950
North	78,050	78,550
South	275,500	275,400
Michigan	50,800	53,100
Mississippi	48,000	47,500
Missouri	90	90
Montana	23,140	21,500
Nebraska	1,750	1,600
New Mexico	113,050	113,000
New York	13,400	13,000
Ohio	9,200	9,000
Oklahoma	325,000	327,500
Oklahoma City	50,200	50,700
Seminole Area	72,000	72,000
Rest of State	202,800	204,800
Pennsylvania	37,400	36,900
Tennessee	30	35
Texas	1,894,950	1,894,350
Upper Gulf Coast	520,550	520,400
East Texas Field	364,500	364,000
Rest of Eastern Texas	126,750	127,000
Lower Gulf Coast	191,250	191,000
Southwest Texas	79,400	79,500
South Central Texas	20,350	20,500
West Texas	354,300	354,200
North Texas	143,350	143,500
Panhandle	94,500	94,250
Utah	10	12
West Virginia	8,700	8,600
Wyoming	86,100	89,050
Total United States	4,381,620	4,381,687

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.
(All figures in thousands of barrels—add 000)

HIGHS AND LOWS OF RECENT YEARS

ITEM	Crude Oil Prod. Barrels Daily	Crude Oil Prod. Week Ended	Runs to Stills Barrels Daily	Runs to Stills Week Ended	Crude Stocks Barrels	Crude Stocks Week Ended	Gasoline Stocks Barrels	Gasoline Stocks Week Ended	Gasoil & Distillate Stocks Barrels	Gasoil & Distillate Stocks Week Ended	Residual Fuel Oil Stocks Barrels	Residual Fuel Oil Stocks Week Ended
Highs:												
1939	3,910	8- 5	3,650	10-21	278,607	5-26	87,769	4-22	39,562	10-28	116,237	8-26
1940	3,890	3-16	3,690	6-22	265,865	8-31	102,817	4-20	49,051	10-19	109,135	9-14
1941	4,337	11-22	4,120	10-18	266,187	3-29	99,727	3-29	[5]54,983	11-15	102,448	1- 4
1942	4,337	2- 7	3,961	1- 3	263,208	3-28	[5]109,281	3-14	49,861	11-14	95,857	1- 3
1943	[1]4,436	11-13	[1]4,331	12- 4	245,752	5-29	94,159	3-20	46,187	11-27	72,881	1- 2
Lows:												
1939	[2]1,601	8-26	3,125	2-18	[2]229,127	10-12	71,152	10- 7	20,722	4-15	105,397	4- 8
1940	3,335	11-30	3,370	1- 6	237,339	1-27	79,847	11- 9	23,551	4- 6	102,344	2-10
1941	3,364	1-11	3,490	1-18	240,399	11-15	79,923	10- 4	[5]28,381	4-12	90,914	7-12
1942	3,297	7- 4	3,393	5-23	231,896	12-12	75,934	12- 5	29,240	4-25	72,962	12-26
1943	3,821	1- 9	3,579	3-13	232,191	1- 9	68,182	10-16	30,732	4- 3	57,596	12-25

TRENDS OF 1942 AND 1943

Trends in Week Ended:	Crude Oil Production Daily	Crude Oil Runs to Stills Daily	Crude Oil Stocks Week End	Gasoline Production Weekly	Gasoline Stocks Week End	Gasoil & Distillate Production Weekly	Gasoil & Distillate Stocks Week End	Residual Fuel Production Weekly	Residual Fuel Stocks Week End
1942:									
January 3	4,038	3,961	244,440	13,797	92,987	3,855	49,357	6,918	95,857
January 31	3,871	3,848	250,740	13,292	97,810	3,817	40,674	6,640	91,189
February 28	4,016	3,675	259,373	12,131	105,635	3,799	34,547	6,813	88,285
March 28	3,820	3,667	263,208	11,663	105,624	3,661	31,756	6,344	83,045
April 25	3,581	3,506	257,073*	10,535	102,897	3,267	29,240	6,869	81,107
May 30	3,877	3,522	255,023	10,478	95,355	3,034	31,384	6,993	79,628
June 27	3,719	3,581	253,364	10,713	88,396	3,549	32,851	6,615	77,304
July 25	3,691	3,658	249,262	10,864	82,281	3,647	35,966	6,796	77,816
August 29	3,964	3,697	249,007	11,300	80,831	3,850	42,060	6,875	78,034
September 26	3,909	3,802	242,785	10,954	80,550	4,215	45,954	7,094	78,943
October 31	3,901	3,731	239,266	11,153	79,159	.....	48,131	.....	79,166
November 28	3,878	3,736	234,850	11,269	78,854	.....	49,739	.....	77,796
1943:									
January 2	3,871	3,734	233,938	10,957	82,420	4,285	42,913	7,683	72,881
January 30	3,826	3,698	233,863	10,339	88,830	3,888	37,057	7,452	70,763
February 27	3,873	3,709	235,217	10,566	93,157	4,230	32,939	7,839	70,140
March 27	3,896	3,742	239,126	10,231	94,079	3,541	30,980	8,018	67,938
April 24	3,913	3,737	242,035	10,583	91,001	3,954	31,142	8,168	67,455
May 29	3,970	4,679	245,752	10,656	83,937	3,798	32,274	7,672	67,682
June 26	3,955	4,015	242,657	11,092	79,589	3,876	34,044	8,126	67,960
July 31	4,133	3,788	238,420	11,127	74,977	3,765	36,363	8,478	66,877
August 28	4,196	4,227	236,170	12,420	72,525	4,351	37,928	8,732	67,250
September 25	3,344	4,156	233,013	12,206	70,024	4,608	40,328	8,560	66,659
October 30	4,383	4,176	237,219	12,813	69,297	4,642	44,591	7,968	63,838
November 27	4,414	4,261	239,761	12,638	69,980	4,379	46,187	8,633	62,143
December 4	4,384	[1]4,331	241,165	13,325	71,040	4,714	45,107	8,348	61,420
December 11	4,377	4,144	240,148	12,570	71,937	4,636	45,510	8,151	59,715
December 18	4,364	4,146	241,795	12,240	72,725	4,387	44,117	8,291	58,272
Dec. 25, 1943	4,363	4,185	.....	12,597	74,024	4,457	43,791	8,689	57,596
Dec. 26, 1942	3,881	3,508	[4]233,227	10,047	77,781	4,081	45,414	7,201	72,943
Change:									
In week	—1	+39	+1,647	+357	+1,299	+70	—326	+398	—676
In year	+482	+677	+8,568	+2,550	—3,757	+376	—1,623	+1,488	—15,347
In year	+12.4%	+19.3%	+3.7%	+25.4%	—4.8%	+9.2%	—3.6%	+20.7%	—21.0%

[1] All time peak. [2] Lowest since April, 1922. [3] Lowest since October, 1922, due to shutdown of six Mid-Continent states. [4] Stocks, December 18, 1942.

barrels per day in the week of December 25, having come down to 43,791,000 barrels. That quantity was 1,623,000 barrels or 3.6 percent lower than the amount held a year before.

Production of residual fuel oil in the nation totaled 8,689,000 barrels in the week ended December 25, an average of 1,241,000 barrels a day, an increase of 59,000 barrels daily over the previous week, and exceeded output in the corresponding week a year earlier by 212,000 barrels daily or nearly 21 percent.

The residual production was not great enough to meet current demand, however, and stocks were drawn upon to the extent of 676,000 barrels, or 96,000 daily, leaving on hand only 57,596,000 barrels. That quantity was less than the storage a year earlier by 15,347,000 barrels or 21 percent, as stocks on December 26 a year ago totaled 72,943,000 barrels.

Year-End Statement Reviews Texas Statistics

Texas oil fields produced 39.11 percent of the nation's oil during 1943, Texas Railroad Commission Chairman, Beauford H. Jester, pointed out last week in a closing summary of events affecting the commission as an administrative body.

In figures, Texas production for 1943 totaled approximately 587,758,689 barrels, as compared with an estimated 1,502,743,073 barrels for the nation, the record production for all previous years.

"Texas refineries produced an even higher percent of the high-octane gasoline for planes, toluene, for the manufacture of TNT, and butadyne, for the manufacture of synthetic rubber. To make this contribution to the war effort, Texas fields produced last year 109,930,469 more barrels of oil than in 1942, an increase of 18.7 percent, and the greatest production of oil in any year in the history of Texas oil production.

"The admonition and recommendation urged since the summer of 1942 by the railroad commission to the Petroleum Administrator for War for increased use of West Texas crude in the war effort bore fruit by the end of the second quarter of 1943. The greatest increase in production in 1943 has been from West Texas—16,685,651 more in 1943 than in 1942. West Texas fields are practically the only fields in Texas that can produce, without waste, more oil than is now being produced.

"The railroad commission is continually studying the ability of each oil and gas field to produce without waste, in order that physical waste may be prevented and sound conservation practices are observed as Texas makes its tremendous and timely production of oil for the war effort. The oil-salt-water ratio order, promulgated for the East Texas field, is accomplishing gratifying results and this order was upheld by the Austin Court of Civil Appeals as not being violative of the marginal-well statute but as being a reasonable and proper conservation measure.

"In 1942 in the East Texas field 29,395,506 barrels of salt water were injected; in 1943 the total will be 64,131,712 barrels, an increase of 54 percent in the amount of salt water re-injected to preserve the bottom-hole pressure of the field.

"Below is an analysis of production and well completions for the year 1943, compiled by the Oil and Gas Division. The last two months, November and December, were estimated as far as production figures are concerned, due to the fact that reports are a month late.

	1942	1943
Total production	477,828,220	587,758,689
Field discoveries	84	114
Dual completions	66	144
East Texas production	120,736,216	128,989,645
Drilling applications	4,571	5,017
Rule 37 applications	782	403
Oil well completions	3,006	2,263
Gas well completions	230	187
Dry holes	1,197	1,523
Wildcats, oil	82	73
Wildcats, gas	30	21
Wells plugged		
Dry	1,185	1,251
Gas	77	101
Oil	1,386	1,290
Total plugged	2,648	2,642

"There are 171 counties in Texas producing oil or gas. Llano County is the only county from which the commission has not received drilling forms indicating intention to drill during 1943.

"The increase in the number of dual completions is noteworthy. Where sand conditions justify, two producing sands are completed and produced from in one well.

"While 30 more new fields were discovered in 1943 in Texas than in 1942, the fields were smaller in the amount of oil discovered.

"The commission has thrown its weight behind the effort to secure a minimum 35-cent increase in the price of crude oil, and will continue to do so and continue to oppose any subsidy in lieu of a price increase.

"New oil and gas reserves must be discovered to maintain safe and adequate reserves for the future and to replace the record-breaking amount of oil Texas is and will continue to produce for the war effort."

PIPE LINE REVIEW

Contract Let for Short Line in West Texas

Stanolind Pipe Line Company has awarded contract to the Fullerton Construction Company, Lubbock, Texas, for the laying of a 10-mile 8-inch discharge line that will extend east from the Yoakum County sector of the Wasson field to tie into Magnolia Pipe Line Company's Slaughter-Seminole 8-inch trunk line. This hookup will make available about 30,000 barrels of crude daily for Stanolind Pipe Line Company's Slaughter-Drumright 16-inch carrier now under construction. The oil will be gathered by Humble Pipe Line Company, Shell Pipe Line Corporation and Atlantic Pipe Line Company and delivered to Stanolind Pipe Line Company's projected tank farm and booster station site in the Wasson field. When the 10-mile relay line goes into service. Magnolia Pipe Line Company will divert its Slaughter field runs to the 16-inch and also deliver a portion of Stanolind Pipe Line Company's receipts from Wasson field to Slaughter station while remainder of the Wasson crude will be consigned to Magnolia on an exchange basis.

Work on Wyoming Line To Start at Early Date

Construction of a new pipe line from the Elk Basin and Little Buffalo fields in Northern Wyoming to the existing trunk pipe line at Casper, approved by WPB, December 7, will assure adequate transportation for the projected increased production of the Elk Basin field, it was assured by PAW, December 29.

The line, on which construction will start as soon as weather permits, together with the Yale pipe-line project from the field to refineries in Laurel and Billings, which also has been approved and will be started in the spring, will provide a combined capacity adequate for the eventual production which is planned, it was stated.

The new line to Casper will be constructed by Stanolind Pipe Line Company as an 8-inch line over the 70-mile stretch from Elk Basin to Little Buffalo Basin and as a 10-inch line over the 160-miles to Casper, where crude may be forwarded through the Stanolind line east to District 2 refineries, south over the Rocky Mountain Pipe Line to refineries at Cheyenne and Denver or west over the Utah Refining Company system, which ties in with Stanolind at Fort Laramie, to Salt Lake City refineries.

Initially, the Stanolind line will have two pumping stations and a capacity of 21,500 barrels daily into Casper but later more stations may be added and capacity increased to 44,000 barrels daily. The line will cost $4,200,000 and is to be completed by next September 1.

PAW's weekly pipe line report disclosed that during the period ended December 17 pumpings through big-inch from Longview to Norris City averaged 310,307 barrels daily and from Norris City east 277,327 barrels daily, of which 121,456 barrels went to the Philadelphia area and 139,462 barrels to the New York area. On one day, December 18, the line pumped 309,827 barrels east from Norris City.

During the seven days ended December 15 the Southwest Emergency Line pumped a daily average of 71,661 barrels of crude from Heard Station.

Mascho Field Will Get Line Outlet

Humble Pipe Line Company has been authorized to proceed with the construction of a 16-mile 6-inch welded crude line to extend from Mascho field, Andrews County, currently the largest producing area in West Texas without pipe line connection, to connect with its Ector station in the North Cowden field. The company's system that serves other fields in Andrews County does not have adequate capacity to absorb the full allowable of the 60 flowing and pumping wells in the Mascho field, so a direct line was ordered built to connect with nearest point on its 8-inch trunk line.

WARREN T. BOSTWICK, Wichita Falls district landman for The Texas Compnay the past 5 years, has been transferred to Denver, where he will be assistant to the division landman. Ed. L. Zihlman, West Central Texas scout and landman at Abilene, succeeds Bostwick, and will be relieved by M. F. Muench, who has been doing scout and lease work at Midland, Texas.

Gravity-Scale Crude Oil Prices in Mid-Continent Fields

Posted in most instances between May 19 and May 21, 1941

GRAVITY	Oklahoma-Kansas	North Louisiana-Arkansas Mississippi				Inland Texas and New Mexico				South Texas		Texas Gulf Coast			Louisiana Gulf Coast						
		[1]Rodessa etc.	[2]Champagnolle etc. Tinsley Miss.	Bunkie, Eola, Olla, S. Olla, Little Crk. (by Standard)	Lisbon, La. (by Gulf)	[3]Atlanta, Buckner, etc. Ark.	North and West Central Texas	[4]Eastern Texas	Panhandle	West Texas, New Mexico	[5]Refugio Type	[6]Mirando Type	[7]Gulf Coast	[8]Anahuac Type	[9]Dickinson Type	[10]Gulf Coast	[11]Standard of La.	[12]Texas Co.	[13]Texas Co.	[14]Magnolia Pet. Co.	[15]Shell Oil Co.	Jennings (by Gulf)	[16]Rocky Mt. Area (Salt Creek, etc.
17-17.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	$0.94	....	....	....
18-18.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.96	....	....	....
19-19.9	....	....	....	....	....	....	....	$0.80	$0.80	$0.70	$1.08	$1.03	$1.06	$0.98	$0.93	$1.06	....	....	....	.98	$0.99	....	....
20-20.9	$0.85	....	....	....	....	$0.68	$0.85	.82	.82	.72	1.10	1.05	1.08	1.00	.95	1.08	$0.90	....	....	1.00	1.01	....	....
21-21.9	.87	....	....	....	....	.70	.87	.84	.84	.74	1.12	1.07	1.10	1.02	.97	1.10	.92	....	....	1.02	1.03	....	....
22-22.9	.89	....	....	....	....	.72	.89	.86	.86	.76	1.14	1.09	1.12	1.04	.99	1.12	.94	....	....	1.05	1.05	....	....
23-23.9	.91	....	....	....	....	.74	.91	.88	.88	.78	1.16	1.11	1.14	1.06	1.01	1.14	.96	....	....	1.08	1.07	....	....
24-24.9	.93	$0.88	$0.86	$1.03	....	.76	.93	.90	.90	.80	1.18	1.13	1.16	1.08	1.03	1.16	.98	....	....	1.11	1.09	....	....
25-25.9	.95	.90	.88	1.05	....	.78	.95	.92 / .97	.92	.82	1.20	1.15	1.18	1.10	1.05	1.18	1.00	....	....	1.14	1.11	....	....
26-26.9	.97	.92	.90	1.07	....	.80	.97	.99	.94	.84	1.22	1.17	1.20	1.12	1.07	1.20	1.02	....	....	1.17	1.13	....	....
27-27.9	.99	.94	.92	1.09	$0.81	.82	.99	1.01	.96	.86	1.24	1.19	1.22	1.14	1.09	1.22	1.04	....	....	1.19	1.15	....	....
28-28.9	1.01	.96	.94	1.11	.83	.84	1.01	1.03	.98	.88	1.26	1.21	1.24	1.16	1.11	1.24	1.06	$1.06	....	1.21	1.17	....	$0.96
29-29.9	1.03	.98	.96	1.13	.85	.86	1.03	1.05	1.00	.90	1.28	1.23	1.26	1.18	1.13	1.26	1.08	1.08	....	1.23	1.19	....	.98
30-30.9	1.05	1.00	.98	1.15	.87	.88	1.05	1.07	1.02	.92	1.30	1.25	1.28	1.20	1.15	1.28	1.10	1.10	$1.05	1.25	1.21	....	1.00
31-31.9	1.07	1.02	1.00	1.17	.89	.90	1.07	1.09	1.04	.94	1.32	1.27	1.30	1.22	1.17	1.30	1.12	1.12	1.07	1.27	1.23	$1.07	1.02
32-32.9	1.09	1.04	1.02	1.19	.91	.92	1.09	1.11	1.06	.96	1.34	1.29	1.32	1.24	1.19	1.32	1.14	1.14	1.09	1.29	1.25	1.09	1.04
33-33.9	1.11	1.06	1.04	1.21	.93	.94	1.11	1.13	1.08	.98	1.36	1.31	1.34	1.26	1.21	1.34	1.16	1.16	1.11	1.31	1.27	1.11	1.06
34-34.9	1.13	1.08	1.06	1.23	.95	.96	1.13	1.15	1.10	1.00	1.38	1.33	1.36	1.28	1.23	1.36	1.18	1.18	1.13	1.33	1.29	1.13	1.08
35-35.9	1.15	1.10	1.08	1.25	.97	.98	1.15	1.17	1.12	1.02	1.40	1.35	1.38	1.30	1.25	1.38	1.20	1.20	1.15	....	....	1.15	1.10
36-36.9	1.17	1.12	1.10	1.27	....	1.00	1.17	1.19	1.14	1.04	1.42	1.37	1.40	1.32	1.27	1.40	1.22	1.22	1.17	....	....	1.17	1.12
37-37.9	1.19	1.14	1.12	1.29	....	1.02	1.19	1.21	1.16	1.06	1.44	1.39	1.42	1.34	1.29	1.42	1.24	....	1.19	....	....	1.19	1.14
38-38.9	1.21	1.16	1.14	1.31	....	1.04	1.21	1.23	1.18	1.08	1.46	1.41	1.44	1.36	1.31	1.44	1.26	....	1.21	....	....	1.21	1.16
39-39.9	1.23	1.18	1.16	1.33	....	1.06	1.23	1.25	1.20	1.10	1.48	1.43	1.46	1.38	1.33	1.46	1.28	....	1.23	....	....	1.23	1.18
40 and Up	1.25	1.20	1.18	1.35	....	1.08	1.25	1.27	1.22	1.12	1.50	1.45	1.48	1.40	1.35	1.48	1.30	....	1.25	....	....	1.25	1.20

[1] Gulf schedule for Caddo, Homer, Haynesville, Bull Bayou, Crichton, De Soto, El Dorado and Rodessa, Texas. Standard of La. schedule for Cotton Valley, Rodessa, Shreveport (Cross Lake), and Caddo. Magnolia schedule for Haynesville, Cotton Valley, Rodessa, and Miller Co., Ark. Texas Co. schedule for "North Louisiana."

[2] Schedule of Standard of La. for Catahoula Lake, Elm Ridge, Hemphill, De Soto, Sabine, Fouke, Homer, Miller Co., Sugar Creek. Schedule of Root Petroleum Co. for Nick Springs, Urbana light, Schuler sweet, Rainbow, South Field (El Dorado), and Champagnolle.

[3] Schedule of Standard of La. for Atlanta, Buckner, Magnolia, Patton, Schuler: Jones sand, Village. Schedule of Root Petroleum Co. for Schuler: Reynolds lime, and Schuler: Jones sand.

[4] Humble schedule for Anderson, Cherokee, Limestone, and Navarro counties and Navarro Crossing field, except that prices from $0 to 92 cents represent postings only for Hawkins field, Wood County. For Talco crude, Magnolia's prices are same as Humble's for Hawkins. Rodessa, Texas, prices are same as in Rodessa, La.-Ark.

[5] Schedule for Refugio, E. White Point, Greta, Melon Creek, Midway, Minnie Bock, O'Connor-McFaddin, Plymouth, Saxet, Taft, and Tom O'Connor.

[6] Schedule for Blanchard, Bridwell, Colorado, Comitas, Eagle Hill, Escobas, Fitzsimmons, Glen, Government Wells (N. and S.), Heyser, Hoffman, Kelsey, Kohler, Loma Novia, Lundell, Manilla, Mirando Valley, Placedo, Randado, Sarnosa, and Tesoro.

[7] Humble schedule for Amelia, Clear Lake, Goose Creek, Hastings, Magnet, Mykawa, Mykawa new, Raccoon Bend, South Thompsons, Sugarland, Thompsons, Webster. Texas Co. schedule for Ariola, Ganado, Hamman, Hillje, Humble, Kubela, Magnet, Manvel, Markham, Mauritz, Old Ocean, Pickett Ridge, Port Neches, Sour Lake, West Columbia, Withers; except that schedule provides $1.36 top, 34 gravity. Pan American Prod. Co. schedule for Hastings and South Houston. Gulf schedule for Spindle Top, Sour Lake, Lovells Lake, West Beaumont, Goose Creek, South Liberty, Big Creek, Blue Ridge, Fannett, Moore, Barbers Hill, Hankamer, Thompsons, Lochridge, Dyersdale, and Hull (old) crudes. Sun schedule for Barbers Hill, Batson old, Cotton Lake, Esperson below 35 gravity, Goose Creek, Greens Lake, Hull below 25, Humble below 35, Nome, North Dayton below 25, Orange, Saratoga, Sour Lake, South Liberty.

[8] Humble schedule for Anahuac, Angleton, Cedar Point, Fishers' Reef, Hull old and new, Pierce Junction, Red Fish Reef, Turtle Bay fields. Sun schedule for Anahuac, Caplen, and Turtle Bay. Gulf schedule for Anahuac, Hull new, Pierce Junction, Orange and Thompsons deep.

[9] Humble schedule for Dickinson, Gillock, Hardin, League City, and Rowan fields. Pan American Prod. Co. schedule for Gillock crude.

[10] Sun Oil Co. schedule for Bayou Blue, Chacahoula, Fausse Pointe, Hackberry (E. and W.), and Vinton. Texas Co. schedule for Bay St. Elaine, Caillou Island, Iberia, Lake Barre, Lake Pelto, Leesville and Port Barre for crude ranging in gravity up to 27-27.9; for lighter oils in those fields see Footnote 12. Gulf schedule for Edgerly, Starks, Vinton, E. Hackberry, Cameron Meadows, Leesville. Deduct 10 cents for Gulf's prices for Timballer Bay, Grand Bay, Quarantine Bay, and West Bay. Deduct 2 cents for Standard of La. prices for University (Baton Rouge) crude of 30 to 35.9 gravity.

[11] Standard of La. schedule for Bayou Mallet, Bayou Sale, Choctaw, Darrow, Jeanerette, Lirette, N. Crowley, S. Crowley, Fort Barre, Potash, Roanoke, St. Martinville. Deduct 10 cents for Anse La Butte.

[12] Texas Co. schedule for Bateman Lake, Dog Lake, Fausse Point, Horseshoe Bayou, Jefferson Island, Plumb Bob, Vermilion Bay, West Cote Blanche, and Delta Duck Club. Add 5 cents to these prices for Texas Co. postings for 28 or higher gravity at Bay St. Elaine, Caillou Island, Iberia, Lake Pelto, Leesville, Port Barre, and Lake Barre.

[13] Texas Co. schedule for Delta Farms, Golden Meadows, Lake Salvador. Also Standard of La. for Golden Meadows.

[14] Magnolia schedule for Lockport, Cameron Meadows, West Gueydan.

[15] Shell Oil Co. schedule at Iowa, Black Bayou, White Castle. For Shell's prices at Roanoke and Chalkley fields deduct 5 cents. For Shell's prices at Gibson South Houma, and West Lake Verret fields deduct 10 cents.

[16] Sinclair-Wyoming Oil Co. prices at Salt Creek, Lost Soldier, Iron Creek, effective May 20, 1941. Deduct 10 cents for East Mahoney and deduct 20 cents for Mahoney and Werta.

MID-CONTINENT FLAT PRICES

FIELD—	Flat Price	Date Posted
Arkansas:		
Big Crk., Columbia, McKamie, Macedonia, Dorcheat, sour dist.	$1.25	2- 3-43
Dorcheat, Macedonia dist'l.	1.30	11-16-42
Smackover, Heavy	.83	5-22-41
Texarkana sweet distillate	1.40	-42
Louisiana, North:		
Cotton Valley Distillate	1.40	9- 1-41
Cotton Valley (Holloway sn.)	1.25	5-22-41
Lisbon Distillate	1.20	5-22-41
Urania	1.15	5-22-42
Louisiana, South:		
Erath	1.21	5-21-41
Garden Island	1.36	5-21-41
Happytown	1.15	5-20-41
Lafitte, Paradis	1.19	5-21-41
Lake Arthur & Tepetate	1.18	5-21-41
Lake Mongoulois	1.36	5-21-41
Ville Platte	1.30	5-22-43
Nebraska:		
Falls City, in field	.90	8- 1-41
Falls City, in tank cars	.95	8- 1-41
Shubert, in tank cars	.97	8- 1-41
Texas:		
Alice, Benavides (No. Sweden), Ben Bolt, Clark-Muil, Sun and Tom Graham	1.35	5-21-41
Cayuga	.90	5-21-41
Chapel Hill 50° and up	1.25	3-19-42
Chapel Hill below 50°	1.18	1-20-42
Clay Creek	1.00	5-22-41
Cleveland	1.26	5-21-41
Conroe	1.43	5-21-41
Esperson 35° & up; S. Esperson (Sun Oil)	1.30	5-22-41
East Texas, Flag Lake	1.25	5-20-41
Flour Bluff, East Flour Bluff, and La Rosa	1.33	5-21-41
Hockley-Cochran Counties	.87	5-21-41
Livingston, Cleveland	1.25	5-20-41
Long Lake	1.23	5-21-41
Luling	1.05	5-21-41
Lytton Springs	1.17	5-21-41
North Rincon	1.45	2- 3-43
Salt Flat, North Salt Flat, Darst Creek, Hilbig, Carroll, Clark, Zoboroski	1.14	5-21-41
Satsuma, Tomball	1.40	5-21-41
Sun Oil Co. at Batson (new), Fig Ridge, Hardin, Hull 25 and up, Humble 35 and up, LaBelle, N. Dayton 25 and up, Oyster Bayou, Seabreeze, S. China, W. Orange and Willow Slough	1.25	5-22-41
South Cotton Lake	1.35	5-22-41
Sun, N. Sun, N. Rincon, Garcia	1.35	5-22-41
Van	1.08	5-21-41
Yates (Deep)	.95	5-20-41
Yates (Shallow)	.82	5-20-41
Yturria (Sun in S. Texas)	.....	.....

MICHIGAN PRICES

Central (Basin):		
Porter, Greendale, Crystal, Wise, Midland, Vernon, Saginaw	$1.44	5-27-41
Buckeye, Edenville, Bentley, Beaverton, Monitor, Kawkawlin	1.42	5-27-41
Freeman, Lincoln, Sherman Redding, Temple, Winterfield, Trenton-Monroe Co., Fork Tws.-Mecosta Co.	1.39	5-27-41
Hamilton-Grout	1.29	5-27-41
Adams	1.27	6- 1-41
Arenac, Clayton, Ogemaw, W. Branch	1.24	5-27-41
Southwest (Shallow):		
Traverse, crude in Allegan, Kent, Ottawa, Van Buren Counties	1.45	6- 2-41
Clare	1.11	5-27-41

MIDDLE WEST PRICES

FIELD—	Flat Price	Date Posted
Lima, Ohio-Ind.	$1.50†	10-28-42
Illinois Basin (Sohio Corp.)	1.37	5-19-41
Lake Centralia-Salem, Illinois	1.37	5-19-41
Eastern Ill.-Western Ind.	1.22	5-21-41
Plymouth, Illinois	1.05	4-28-43
Western Kentucky	1.37	8- 9-43
Birk City, Western Kentucky	1.37	8- 9-43
Kentucky River, Eastern Ky.	1.43	6-19-41
Big Sandy River, Eastern Ky.	1.43	8- 9-43
Cleveland, Lodi, Chatham, Ohio	1.30	9- 1-41

ROCKY MOUNTAIN STATES PRICES

Colorado:		
Canon City and Florence	$1.05	5-21-41
Iles	1.07	5-20-41
Montana:		
Cat Creek	1.15	4- 1-41
Cut Bank (6 Buyers)*	1.05-1.20	3-30-42
Dry Creek	1.02	5-20-41
Sunburst	1.00	5-20-41
New Mexico:		
Artesia	.94	5-21-41
Hogback	1.00	10-11-38
Wyoming:		
Big Muddy	1.08	5-30-41
Byron	.70	3- 4-43
Elk Basin	1.00	5-21-41
Elk Basin, Black	.90	4-28-43
Frannie, Light	.85	2-26-43
Frannie, Heavy	.62	2-26-43
Garland	.60	3- 4-43
Grass Creek, Light	1.00	5- 1-41
Grass Creek, Heavy	.65	4- 1-43
Hamilton Dome	.60	2-26-43
Lance Creek (Ohio Oil Co.)	1.12	7- 1-41
Mill Creek	.72	10-11-38
Oregon Basin	.65	3- 4-43
Osage	1.30	10-11-38
Poison Spider	.65	2-26-43
Rock River	1.15	5-21-41
Salt Creek, Tensleep Heavy	0.8285	2-27-43

*About 25% of Cut Bank crude brings $1.20 per barrel; 65% less than $1.20 and minimum $1.10; and 10% less than $1.10.

†$1.50-price applies to about ¾ of field's production; $1.50 to ¼ of it.

Wholesale Prices of Refined Products in Principal Markets

REFINED GASOLINE	Current Range (Cents a gal.)		Changes from Month Ago	
Oklahoma Refineries:				
60 Oct. & Under.	5¼	5¼	...	...
63-66 Octane	5⅝	5⅝	...	...
72 Octane	6	6	...	...
76 Octane, Ethyl.	6¾	6¾	...	...
Mid-Western Tank Car:				
60 Oct. & Under..	5¼	5¼	...	...
63-66 Octane	5⅝	5⅝	...	...
72 Octane	6	6	...	...
76 Octane, Ethyl.	6¾	7¼	...	...
New York Harbor:				
68-70 Octane	9¼	9¼	...	...
72 Octane	9¾	9⅞	...	...
Gulf Coast. Cargoes:				
60 Oct. unleaded.	5	5	...	...
66 Oct. unleaded.	5¼	5¼	...	...
68 Oct. unleaded.	5½	5½	...	—⅛
70 Oct. unleaded.	5⅝	5⅝	+⅛	...
63-65 Oct. leaded	...	...	...	...
72 Oct. leaded...	5⅝	5⅝	...	...
Min. 76 Oct. l'ded	6¾	6¾	...	...
NATURAL GASOLINE				
Grade 26-70:				
F.O.B. Group 3..	4¾	4¾	...	...
F.O.B. Brk'g, Tex	3¾	3¾	...	...
KEROSENE				
Oklahoma Refineries:				
41-43 water white	4⅜	4⅜	...	...
42-44 water white	4½	4½	...	...
Mid-Western Tank Car:				
41-43 water white	4⅜	4⅜	...	...
42-44 water white	4½	4½	...	...
New York Harbor	7⅛	7⅛	...	...
†Gulf Coast:				
41-43 water white	4¼	4¼	...	...
42-44 water white	4⅜	4⅜	...	...
RANGE OIL				
At Okla. Refs....	4	4⅛	...	...
In Mid-Western Mkt. Group 3, basis..	4	4⅛	...	...
LIGHT FUEL OILS				
Oklahoma Refineries:				
No. 1 prime white	3⅜	3⅜	...	...
No. 1 straw	...	...	...	...
No. 2 straw	3⅛	3⅛	...	...
No. 3	3½	3½	...	...
Mid-Western Tank Car:				
No. 1 prime white	3⅜	3⅜	...	...
No. 2 straw	3⅛	3⅛	...	...
No. 3	3½	3½	...	...
New York Harbor:				
No. 1	7⅛	7⅛	...	...
No. 2	6¾	6¾	...	...
No. 3	6¾	6¾	...	...
Gulf Coast Cargoes:				
No. 2	3¾	3¾	...	...
DIESEL & GAS OILS (Cents per gallon, cargoes, according to Diesel index number)				
Gulf Coast:				
43-47 diesel index	4	4	...	...
48-52 diesel index	4	4	...	...
53-57 diesel index	4⅛	4⅛	...	...
58 and above....	4¼	4¼	...	...

HEAVY FUELS	Current Range (Per Bbl.)		Changes from Month Ago	
Oklahoma Refineries:				
No. 6	...	...	...	...
14-16 Gravity	$0.97	$0.97	...	...
Mid-Western Tank Car:				
No. 5	.85	.85	...	...
No. 6	.80	.80	...	...
New York Harbor:				
No. 5	1.95	2.01	...	...
No. 6	1.65	2.07	...	...
BUNKER C FUEL OIL (Per barrel, ships' bunkers)				
Gulf Coast	$0.85	$1.27	...	...
New York Harbor...	1.65	2.07	...	...
DIESEL OIL, HEAVY (Per barrel, ships' bunkers)				
Gulf Coast, below 25 grav.	$1.35	$1.35	...	...
Gulf Coast 25 grav...	1.65	1.65	...	...
New York Harbor...	2.75	2.75	...	...
LUBRICATING OIL (Cents a gallon)				
Oklahoma Refineries:				
Bright stock (viscosity at 210°):				
200 vis. D, 10-25 pour point	.27	27	...	...
150-160 vis. D:				
0-10 pour point	23	23	...	...
10-25 pour point	22½	23	...	...
25-40 pour point	23	23	...	...
150-160 vis. E	22	22	...	...
120 vis. D, 0-10 pour point	22	22	...	...
Cylinder Stocks:				
600 s.r. dark green	8½	8½	...	...
600 s.r. olive green	10	11	...	...
631 s.r.	...	...	...	...
Neutral Oils (viscosity at 100°, 0-10 pour point):				
Pale Oils:				
60- 85 vis. No. 2 color	8	8	...	...
86-110 vis. No. 2 color	8½	8½	...	...
150 vis. No. 3 color	14½	14½	...	...
180 vis. No. 3 color	15	15	...	...
200 vis. No. 3 color	15	15	...	...
250 vis. No. 3 color	16	16½	...	...
280 vis. No. 3 color	17	17	...	...
300 vis. No. 3 color	18	18	...	...
Red Oils:				
180 vis. No. 5 color	15	15	...	...
200 vis. No. 5 color	15	15	...	...
280 vis. No. 5 color	..	..	...	...
300 vis. No. 5 color	17½	17½	...	...

LUBRICATING OIL (Cents a gal.)			Changes from Month Ago	
Western Pennsylvania:				
Cylinder Stocks:				
600 s.r. filtrable	15	15	...	...
650 s.r.	15½	15½	...	...
600 flash	16	16	...	...
630 flash	17	17	...	...
Bright Stock (No. 8 Color, 145-155 vis. at 210°, 540-550 fl.):				
10 pour test	30½	30½	...	...
15 pour test	29½	29½	...	...
25 pour test	25	25	...	...
Viscous Neutrals (No. 3 Color, vis. at 70°):				
200 vis. (180 at 100), 420-425 fl.:				
Zero pour test	35	35	+2	+2
10 pour test	34	34	+2	+2
15 pour test	33	33	+2	+2
25 pour test	28	32	+1	+⅛
150 vis. (143 at 100), 400-405 fl.:				
Zero pour test	33	33	+2	+2
10 pour test	32	32	+2	+2
15 pour test	31	31	+2	+2
25 pour test	26	30	+1	+1½

EASTERN STATES CRUDE OIL PRICES

FIELD—	Flat Price	Date Posted
Bradford-Allegany	$3.00	3-26-42
Sw. Pa. Pipe Line	2.65	3-26-42
Eureka Pipe Line, W. Va.	2.59	3-26-42
Corning Grade, Ohio	1.31	5-27-41
Buckeye Crude Ohio	2.30	6-18-41

MAJOR CRUDE OIL PRICE CHANGES

	Penna. Grade	Mid-Cont. (36 Gr.)	Calif. (26 Gr.)
May 22, 1940	Cut 25	.....	.....
June 18, 1940	Cut 25	.....	.....
July 12, 1940	Cut 25	.....	.....
Aug. 28, 1940	Cut 15	.....	.....
Nov. 12, 1940	Up 15	.....	.....
Dec. 17, 1940	Up 15	.....	.....
Jan. 27, 1941	Up 15	.....	.....
April 1, 1941	.....	Up 5	.....
April 23, 1941	Up 10	.....	.....
May 19, 1941	.....	Up 10	.....
May 21, 1941	Up 15	.....	.....
June 18, 1941	Up 20	.....	.....
Aug. 14, 1941	Up 23	.....	.....
Aug. 25, 1941	Cut 23	.....	.....
March 26, 1942	Up 25	.....	.....
April 1, 1943	.....	.....	Up ‡25

‡ 14 and 15 gravity.

CRUDE OIL PRICES IN CALIFORNIA

Prices per barrel in field, posted by Standard Oil Company of California, effective May 25, 1943.
All gravities above those quoted take highest price offered in that field.

GRAVITY	Signal Hill (Long Beach)	Wilmington	El Segundo	Seal Beach	Huntington Beach	Inglewood	Olinda, Brea Canon	Athens-Rosecrans	Terrance	Richfield	Whittier, East Coyote (La Habra)	Montebello	West Coyote Hills	Santa Fe Springs	Newhall, Kern River Kern Front, McKittrick Round Mountain	Greeley, Canal, Wasco	Coles Levee	Mountain View	Elk Hills, Buena Vista Hills, Midway-Sunset, Lakeview Area	Lost Hills	Coalinga	Wheeler Ridge	Kettleman Hills	Elwood Terrace
12-12.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	$0.94	....	....	....	$0.94	$0.94	$0.94	....	....	....
13-13.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.96	....	....	....	.96	.96	.96	....	....	....
14-14.9	....	$0.93	....	....	$0.96	....	$0.96	....	$0.95	$0.95	$0.95	$0.97	....	....	.98	....	....	....	.98	.98	.98	....	....	....
15-15.9	....	.96	....	....	1.00	$1.01	.97	....	.97	.96	.97	.97	....	....	*Playa	....	....	....	.98	.98	.98	....	....	....
16-16.9	....	.96	$1.01	....	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	del	....	....	....	.98	.98	.98	....	....	....
17-17.9	....	.96	1.01	....	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	Rey	....	....	....	.98	.98	.98	....	....	....
18-18.9	$0.93	.96	1.01	....	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	.88	....	....	....	.98	.98	.98	....	....	....
19-19.9	.93	.96	1.01	....	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	.88	....	....	$0.98	.98	.98	.98	....	....	....
20-20.9	.93	.96	1.01	....	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	.88	....	....	.98	.98	.98	.98	....	....	....
21-21.9	.93	.96	1.01	....	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	.88	....	....	.98	.98	.98	.98	....	....	....
22-22.9	.96	.98	1.02	$0.88	1.00	1.01	.97	....	.97	.96	.97	.97	....	....	.88	....	....	.98	.98	.98	.98	$0.95	....	....
23-23.9	1.00	1.02	1.05	.92	1.02	1.01	.98	....	.97	.98	1.00	.97	....	....	.91	....	....	.98	.99	.98	.98	.95	....	....
24-24.9	1.03	1.06	1.07	.97	1.05	1.04	1.01	....	1.01	1.02	1.03	.97	$0.99	....	.95	....	....	.98	1.03	.99	.98	.95	....	....
25-25.9	1.07	1.09	1.10	1.01	1.08	1.07	1.04	....	1.05	1.06	1.07	.98	1.02	....	.99	....	....	.98	1.07	1.01	.98	....	....	....
26-26.9	1.11	1.12	1.12	1.06	1.11	1.10	1.08	....	1.09	1.10	1.11	1.01	1.06	....	1.03	....	....	.98	1.11	1.04	.98	....	....	....
27-27.9	1.15	1.15	1.15	1.10	1.14	1.14	1.11	....	1.13	....	1.15	1.05	1.10	$1.04	....	....	....	1.01	1.15	1.07	.98	....	....	....
28-28.9	1.18	1.18	1.17	1.15	1.17	1.17	1.14	....	1.17	....	....	1.08	1.13	1.08	....	....	....	1.04	1.19	1.10	1.00	....	....	....
29-29.9	1.20	1.21	....	1.19	1.20	1.20	....	$1.17	....	....	....	1.12	1.17	1.12	....	....	....	1.07	1.24	1.13	1.02	....	....	....
30-30.9	1.23	1.24	....	....	1.23	1.22	....	1.21	....	....	....	1.15	1.21	1.15	....	$1.01	$1.09	1.10	1.28	1.16	1.04	....	....	FOB
31-31.9	....	....	....	....	....	1.24	....	1.25	....	....	....	1.19	1.24	1.19	....	1.04	1.12	1.14	....	....	1.06	....	....	Ship
32-32.9	....	....	....	....	....	....	....	1.29	....	....	....	1.23	1.28	1.23	....	1.07	1.14	1.17	....	....	1.09	....	....	....
33-33.9	....	....	....	....	....	....	....	1.32	....	....	....	1.27	....	1.26	....	1.10	1.17	....	....	....	1.11	....	....	$1.22
34-34.9	....	....	....	....	....	....	....	1.36	....	....	....	1.31	....	1.30	....	1.13	1.20	....	....	....	1.13	....	....	1.25
35-35.9	....	....	....	....	....	....	....	....	....	....	....	1.35	....	....	....	1.16	1.22	....	....	....	....	....	$1.23	1.28
36-36.9	....	....	....	....	....	....	....	....	....	....	....	1.39	....	....	....	1.19	1.25	....	....	....	....	....	1.26	....
37-37.9	....	....	....	....	....	....	....	....	....	....	....	1.43	....	....	....	1.22	....	....	....	....	....	....	1.29	....
38-38.9	....	....	....	....	....	....	....	....	....	....	....	1.47	....	....	....	1.25	....	....	....	....	....	....	....	....
39-39.9	....	....	....	....	....	....	....	....	....	....	....	1.51	....	....	....	....	....	....	....	....	....	....	....	....
40-40.9	....	....	....	....	....	....	....	....	....	....	....	1.53	....	....	....	....	....	....	....	....	....	....	....	....

* Effective April 1, 1943, posted by Union Oil Company of California.

International Developments

Hopkins Questions Postwar Operations at Norman Wells

Oliver B. Hopkins, chief geologist of Imperial Oil, Ltd., has made the statement that "It is a question what the end of the war will mean to Norman oil. Expanded only to meet immediate emergency needs, the peacetime future of the field will probably depend upon the extent of development of the great Canadian northwest." Inasmuch as Canol crude is admittedly the world's most expensive oil, costing some $8 a barrel to produce, there seems to be ample reason for believing that the Norman field will go into dormancy with the war's end.

Imperial Refinery at Regina Is Enlarged

Imperial Oil, Ltd., has completed construction of additional refining facilities at its Regina plant, in Saskatchewan. Enlargement of the refinery and the addition of aviation-gasoline units was begun in 1941. It is reported that crude oil capacity has been boosted from 7000 to 9500 barrels per day, and its high-octane output nearly doubled. Further expansion of the refinery is planned as a postwar project, when an additional tower and furnace will be added, raising the plant's capacity to at least 12,000 barrels daily. All new equipment was designed for processing Turner Valley crude.

Hydrogenation of Abasand Tar Sands Urged

A group of Canadian fuel experts are urging the dominion government to put up a hydrogenation test plant at the Abasand site, even though the newly-erected Abasand hot water extraction plant is scheduled for completion within the next three or four months, at Fort McMurray. There is a feeling among many Canadian engineers that the Alberta tar sands may be more amenable to treatment by hydrogenation than by any simpe extraction process so far tried or contemplated.

New Field Opened In Athabaska Area

Although cold weather is delaying a production test, a wildcat in the Athabaska district of northwest Alberta, has proved a new field on the large structure near Fort Assinaboine. Drilled as a joint project by East Crest Oil Company and Davis Petroleum Company, on their joint lease of 54,000 acres, Decca 4, filled with oil of very low gravity. Tubing was run, shutting off the gas above the oil saturation, whereupon the well began to flow.

British Dominion Company Has Best Turner Valley Well

Largest producing well of the past year in the Turner Valley field is British Dominion Oil Company's No. 5, at the north end of the field, which has yielded approximately 130,000 barrels in the five months since its completion, to the end of November. Second best well in the field, on the basis of current production, is Home-Millarville 14, which produced slightly more than 100,000 barrels in 9 months, after completion in February.

British Dominion 7, now drilling, topped the Cardium sand at 3520 feet, and was at 4310 feet on December 15. The Cardium top in this well indicates that the well is perhaps 400 feet higher on structure than the closest adjacent well.

34 Drilling Operations At Turner Valley

There were 34 drilling operations in progress in the Turner Valley field on December 15, with 17 separate companies represented. Foothills 13, at 10,155 feet, was the deepest currently drilling, and was testing the Upper Porous formation. Northend Petroleum 1, at 8944 feet, was still standing cemented since December 6, and Calmont-Millarville 1, another deep test, was awaiting orders at 9649 feet. Average daily production from 202 wells in the field on December 14 was 26,084 barrels, more than 2500 barrels better than that of the previous week. Three abandonment notices were filed in the week ending December 14.

Canol Products Lines May Be Extended

Major General W. W. Foster, special commissioner of the Canadian government for defense projects in the Northwest, has revealed that plans are being made for extending the gasoline pipe line that runs at present from Skagway to Whitehorse, and on down to Watson Lake—serving a number of air fields en route. It is supposed that the extensions will be added to serve more air fields when the refinery is completed at Whitehorse and crude oil begins to come through the 1630-mile line from Norman Wells. All gasoline now entering the products line at Skagway is hauled from United States West Coast ports by tanker.

Wildcat Hits Richest Vermilion Pay

Apex Oil Company's No. 1, 7 miles southwest of the Vermilion field in Alberta, is reported to have encountered the richest pay sand yet discovered in the area. Geological details have not yet been released, and the well had not yet been put on production on December 24. Since the original Vermilion field is bounded on the south by a number of dry holes, the strike probably means the proving of a productive area on the same structural trend.

Gulf Exploring Duke of Windsor's Ranch

Gulf Oil Corporation has geological and geophysical parties at work on a 321,000-acre block of leases south of Turner Valley, and including the EP Ranch, owned by the Duke of Windsor. The duke visited the ranch in 1941 and at that time arranged for the exploratory work to be undertaken. Reports that arrangements have been made for drilling tests on the ranch property are regarded as premature, since Gulf Oil Corporation has not yet applied for permits to do so.

Caribbean Reserves Seen as Important Source After War

C. H. Lieb, president of Creole Petroleum Corporation, points to the surplus reserves of the Caribbean area as the "bright spot of the future" as regards United States crude oil supplies. He estimates the reserves of Columbia, Venezuela and Trinidad alone to amount to at least 25 percent of those of the entire United States, and expects them to be drawn on heavily immediately after the war, without relation to the current campaign to boost production there for military needs. Postwar demands for this oil will be founded on the inability of United States fields to meet gasoline needs after gas rationing comes to an end and the manufacture of automobiles is resumed, he stated.

Creole Petroleum Corporation operates only in Venezuela. Its production during 1943 has averaged more than 250,000 barrels daily, and has been increasing rapidly during recent weeks.

Taber Field Production Halted

All producing wells in the Taber field, southern Alberta, have been closed down because of lack of market outlet for the 20-gravity oil from that field. The shut-down occurred just as a new 400-barrel well was brought in there that was expected to double the field's output, which amounted to more than 10,000 barrels in November. The current fate of Taber operators depends upon a decision as to whether or not this low-gravity oil can be cracked. In the meantime, Dominion Oils, Limited, owner of the new producer, and largest producer in the field, is going ahead with new tests, and has spudded a wildcat at Crow Indian Lake, nearby. The company is negotiating with the office of the provincial oil controller in an effort to find markets for Taber field crude, if only for use as fuel oil.

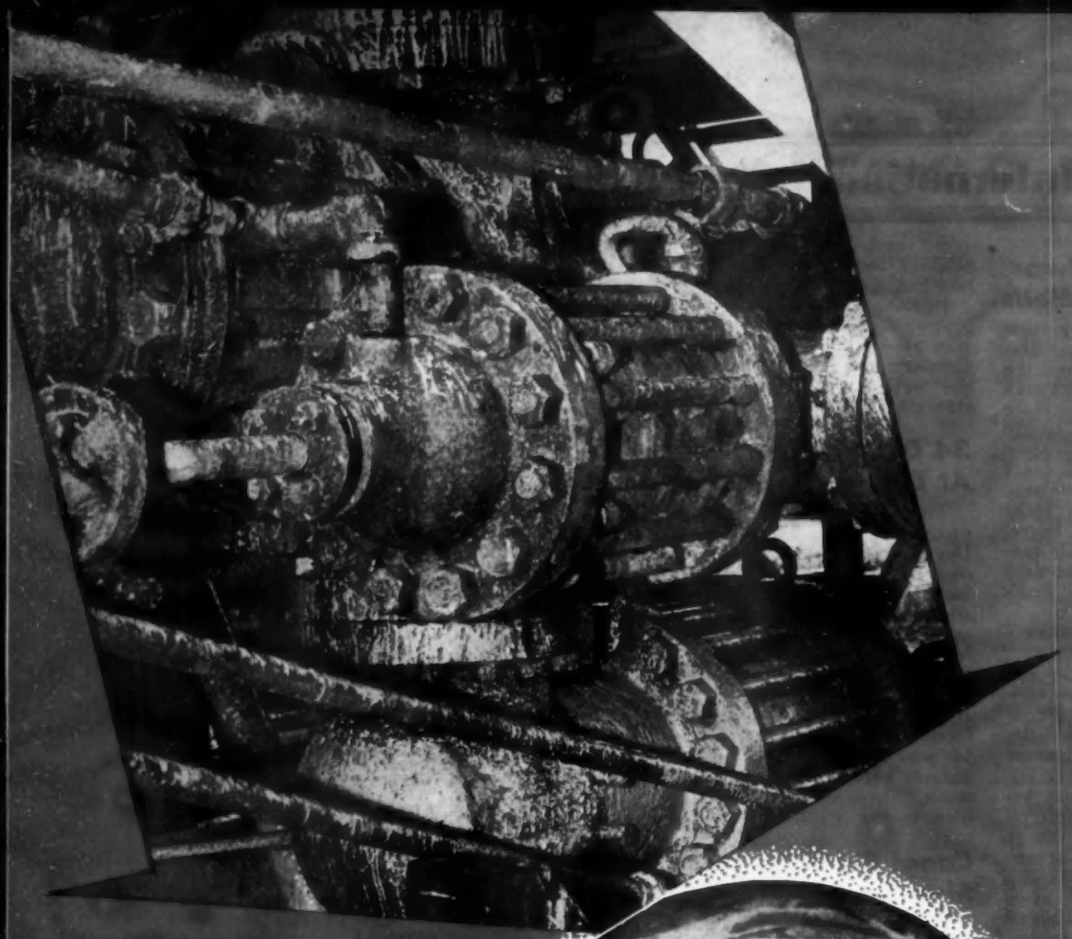
Chinese Government Pushing Oil Development

Recent advices from the Far East indicate that extensive exploration and test drilling campaigns are under way in the Urumchi area of Sinkiang province, in extreme northwest China. The presence of petroleum in the region has been known for many centuries, and oil has long been recovered there from pit wells, bailed by hand. It is reported that the Russian government has supplied equipment and technical personnel for more or less up-to-date exploratory drilling, and that results are proving encouraging. Details are not yet available.

Texas Company Merges Foreign Divisions

The export sales and foreign production divisions of The Texas Company have been consolidated into a single new department called "Foreign Operations," for complete centralization of the company's post-war operations overseas. C. E. Olmstead, vice president, has been given charge of the new department.

HERE'S WHY ADEQUATELY CAMERON-IZED WELLS DON'T BLOWOUT THROUGH THE FLOWLINE



A 100,000,000 cu. ft. wild gasser in South Texas blowing thru a Cameron Pressure Operated Gate Valve in a capping manifold. Four days after installing the manifold, the valve closed and sealed perfectly.

Unretouched photograph of the sand-cut seat of a Cameron Pressure Operated Flowline Gate Valve. With part of the seat cut away and a ½" deep groove cut entirely across the face of the seat, the patented *self-feeding* gate packer sealed perfectly when closing pressure was applied. No conventional valve offers this unique and valuable feature.

Control valves for Cameron Pressure Operated Flowline Valve and other Cameron Pressure Operated Drilling Control Units are in easy reach of the driller.

A Cameron Pressure Operated Flowline Gate Valve is just as essential to safe drilling as Cameron Pressure Operated Blowout Preventers and Master Valves. Numerous disastrous blowouts on record can be traced directly to the failure of conventional flowline valves whose delicate sealing surfaces cannot be expected to effect a seal after having been sand cut to any extent. On the other hand, Cameron Pressure Operated Flowline and Master Gate Valves have demonstrated their ability, time after time, to seal tightly even though the seat has been substantially cut away by abrasive laden fluid and gas. The patented self-feeding gate packing element instantly feeds resilient packing material into the recesses of the damaged seat and effects a pressure-tight closure.

To operators who do not feel that they could depend upon their present Master Gate or Flowline Valve for equally positive and dependable performance under adverse conditions, we shall be pleased to forward complete details pertaining to the Cameron Pressure Operated Gate Valve.

CAMERON IRON WORKS, INC.

711 MILBY ST., HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y. *California:* The Howard Supply Co., Los Angeles. *Rocky Mountain:* Mountain Sales & Service, Casper, Wyoming.

U. S. Field Operations

Illinois

Wayne County Discovery Well Being Completed

Felix Jablonski has Orndorff 1, NW NW 3-1n-9e, nearing completion as an Aux Vases sand pool opener for Wayne County. The well pumped 86 barrels of oil in 21 hours from pay at 3104-19 feet after a 30-quart shot and is still pump testing.

Sangamon County: O. A. Reed's wildcat, Ross 1, SE SE SW 21-15n-3w, which a week ago created considerable interest when an odor of oil and no sign of water was found in Trenton lime, proved a disappointment this week when the well was abandoned at 2314 feet. Located 25 miles southeast of Springfield, it is in an area far from production.

Hamilton County: Bur-Kan Petroleum Company's interesting wildcat, Tyler 1, C N½ SE NE 33-5s-7e, located on a 137-acre block in an area essentially under lease to Pure Oil Company, is ready to begin drilling.

William Layton's Jurgens 1, SW SE 28-4s-6e, a new Hamilton County wildcat, is drilling below 800 feet.

Clinton County: C. H. Nickerson and Others' Goffray 1, NE NE SE 2-1n-3w, is shut down at 972 feet until after the holidays. The well, located in wildcat territory, is running structurally higher than nearest producing wells.

Jefferson County: Central Pipe Line Company is rigging standard tools to drill plug at Henry 1, NE SE 13-2s-4e, which has opened the Aux Vases sand as a new pay for the Markham City North pool. The well flowed oil from the sand in a drill-stem test. Several new locations have been in the area on the strength of the new discovery, which also carried a commercial show in the Aux Vases sand.

Newest wildcat location for Jefferson County is Kewanee Oil & Gas Company's Wilbur 1, NE NW SW 4-3s-3e.

Franklin County: John Stelle, a former governor of Illinois, has assembled a 3000-acre block in Franklin County centering around sections 13, 14 and 15, and is preparing to drill a wildcat test. Location has not been made.

Fayette County: The Texas Company is drilling below 3170 feet at Stokes 1, SW NW NW 7-8n-1e, a wildcat test in Ramsey township. Dry in the Devonian lime, the well is scheduled to test Trenton lime.

Clay County: Eason Oil Company has Peters 1, NW NE NE 29-5n-7e, three fourths of a mile southeast of the one-well Bible Grove South pool, drilling below 2351 feet and slated for a test of McClosky lime.

White County: N. V. Duncan's Bisch 1, 31-3s-14w, is showing for an extension of the Calvin pool. Casing was set for a test of Tar Springs sand at 2304 feet.

Indiana

Severe Weather Causes Decline in Field Work

Bennett Brothers are still testing their pool opener, Spencer 1, NE SE SW 32-6s-14w, 3½ miles west of the Mt. Vernon pool and waiting on tanks. In early tests the well yielded 15 barrels of oil per hour through casing on swab tests of Tar Springs sand.

Activity in Indiana slid back this week as severe snow storms hampered operations. Sixty-eight operations were recorded as compared with 70 the previous week, and they included 32 wells drilling, 20 locations, 7 wells rigging tools and 9 inactive tests. First reports totaled 10 as compared with 9 a week ago. Three of the first reports were wildcats.

Thirty wildcats were in operation, including 14 wells drilling, 8 locations, 3 wells rigging tools and 5 inactive tests.

Six oil wells were completed with total initial production of 612 barrels.

Kentucky

Nine First Reports Include Three Wildcats

Work in the Kentucky oil fields increased this week with operations moving up from 80 to 83.

Nine first reports, including 3 wildcats, were recorded. Sixty-three wells were drilling, 9 were locations, 7 were rigging tools and 4 were inactive.

Wildcat operations totaled 30 and included 24 wells drilling, 2 locations, 3 wells rigging tools and 1 inactive test.

Only 4 oil producers were completed and the total initial production was 200 barrels. Two holes were dry.

Rocky Mountain Area

Important Tensleep Tests In Wyoming and Montana

Two Tensleep tests were started in the Little Grass Creek gas field, Hot Springs County, Wyoming. Goodstein et al's Mountain State Power 3, C SW SW 11-46n-99w, is moving in rotary, and Continental Oil Company's Unit 1, C SE NE 11-46n-99w, is drilling at 2640 feet. The Little Grass Creek gas field is located in Sections 10 and 11, Township 46 North, Range 99 West, and is separated from the Grass Creek oil field by a narrow syncline. It is a small symmetrical dome with 500 feet of closure. Surface formation is Cody shale and gas is produced from the Frontier formation at 2700 feet.

In the Grass Creek oil field 24-gravity oil is produced from the Embar-Tensleep and the formation has an average thickness of 260 feet. The productive area of the black oil series at Grass Creek is estimated at 2000 acres.

Dry Creek Tensleep Test: Ohio Oil Company is drilling at 412 feet in Northern Pacific Railroad 18, NE NE SW 3-7s-21e, in the Dry Creek field, Carbon County, Montana, located 18 miles northwest of the Elk Basin field. Dry Creek is a highly faulted anticlinal dome some 7 miles long and 4 miles wide. Surface formation is Lance and Ft. Union beds. The Eagle and Frontier formations produce gas and the Cloverly (Kootenai) produces oil. The present well is the first to test the Tensleep at Dry Creek.

New Mexico

Lynn Edge Well Blows Heavy Flow

Texas Pacific Coal & Oil Company's State 11-A, on the northeast edge of the Lynn field, Lea County, blew out at 3592 feet while entering the top of the oil zone and attained a flow rated at 100,000,000 feet of gas daily with spray of oil estimated at 50 barrels hourly. The blowout occurred before the oil string was landed, thus enabling the production to reach porous zones above and break through to the surface. Control of the flow was in prospect late last week, as the oil was mudded off.

Continental Oil Company et al's Meyer 1-A-29, situated on a strike between the South Eunice and Lynn areas, is rated at 2,240,000 feet of gas daily from perforations in upper lime after plugging back to 3450 feet. This outpost was drilled to 3710 feet, and tested a small volume of oil with considerable water in plugging back by stages.

Buffalo Oil Company's State-Sun 1, C NE NE 18-17s-34e, semi-wildcat west of Vacuum field, was drilling 5042 feet in San Andres, topped at 4610 feet, or 45 feet high to the nearest failure. This new prospect failed to encounter porous zones that indicated commercial production in the abandoned test.

Humble Oil & Refining Company's Leonard 1, projected Ordovician test 6 miles south of an Ellenburger failure, was drilling at 8790 feet. No shows of any consequence were reported in the Lower Permian series in contrast to numerous zones carrying porosity and oil saturation in the other deep test situated on a separate and higher structure.

West Texas

Show Gives Promise In Upper Midland Basin

Oil production from the upper portion of the Midland Basin sector of West Texas assumed promising outlook when the Dawson County wildcat of Seaboard Oil Company on the A. J. Spraberry 320-acre tract, C NE NE T&P 38, Block 34, T-5-N, flowed a head of 37.4-gravity oil for 15 minutes after being shut in for 52 hours. Swabbing test then revealed an abundance of salt water with 1 to 2 percent oil, and fluid column remained constant between the 3500-4000-foot level. The oil production is coming from Lower Clear Fork sand, topped at 6630 feet with elevation of 2919 feet, while the water is possibly from several zones below 6900 feet. This production test was made with open hole below 5½-inch casing set at 6600 feet to 7679 feet, total depth. The prospect will be plugged back to 6860 feet for further tests. The company holds lease on 7600-acre supporting block. Spraberry 1 is 30 miles east by south of the Cedar Lake field, nearest production.

Lynn County: Sohio Producing Company's Allsup-Honolulu 1, New Home prospect, was drilling at 5160 feet, having logged porosity, ranging up to 22 percent but without oil shows, at 4600-60

feet. The company has made location for Rinne 1, C SE SW BS&F 262, Block Z, also on acreage farmed out by Honolulu Oil Corporation for a 6000-foot test.

Crane County: John I. Moore et al's Barnsley 1, C NE NE PSL 42, Block 32, opened a new pool 2⅜ miles east of the south extension of the Sand Hills field, rated at 2½ barrels of oil, plus acid residue, per hour on swabbing test after treating broken pay in Clear Fork at 4500-4651 feet. Top of pay is 285 feet low when correlated with the nearest Clear Fork (Tubb) producer. Magnolia Petroleum Company's Glenn 3, ¼-mile southwest of the largest of two Simpson sand producers in the McKee pool, tried to flow oil when tester was used in McKee sand at 6080-6105 feet. The well was deepened to 6141 feet, where pipe was set to complete through perforations.

Reeves County: Standard Oil Company of Texas' Keasler 1, deepest test in the Delaware Basin and one of the comparatively few Bone Springs, or Basal Permian explorations, was drilling hard sandy-lime and sand at 8419 feet. Hard sand at 8174-82 feet carried nominal odor of oil. This wildcat entered Delaware lime at 3877 feet with elevation of 2837 feet, and is more than 600 feet in the Bone Springs zone. The company's T. P. Land Trust 2-17, ⅝-mile southeast of its Orla pool discovery, pumped 25 barrels of oil and 86 barrels of salt water daily after a 120-quart nitro shot in Delaware sand at 2954-3042 feet, having plugged back from 3047 feet.

Pecos County: Siemoneit Drilling Company and E. M. Wahlenmaier's Crockett-Shell 1, 5½ miles southeast of Abell field and the same distance northeast of Apco field, was awaiting orders after recovering 3480 feet of rotary mud and sulphur water when tester was used at 4780-4812 feet in Ellenburger, topped at 4700 feet with elevation of 2366 feet. Globe Oil & Refining Company and Forest Development Corporation's Colden 1, situated 4 miles south by west of Abell field, was drilling at 6180 feet with cores yielding nominal gas shows from Waddell, or Basal Simpson, topped at 5770 feet with elevation of 2419 feet.

Wasson Extension: Woodley Petroleum Company's Farmer-Honolulu 1, C SW SW Section 635 and 2 miles north of Yoakum County sector of the field, averaged 3½ barrels fluid hourly, averaging 2 to 3 percent bs&w, on swabbing test after using 5000 gallons of acid. Production is from saturation at 5270-90 feet in San Andres, topped at 4620 feet with elevation of 3625 feet, and within the same producing contour as nearest wells, which are on a line between dry holes. This outpost plugged off water at 5331-37 feet.

East Texas Lease Sale Nets $41,666 Per Well

A cash consideration of $1,500,000, or $41,466 per well, was paid by R. E. Smith, Houston producer, in acquiring Thomas D. Humphrey's Angus Spear 20.32-acre lease with 36 flowing wells in the Kilgore sector of the East Texas field. The first well on this densely drilled lease was placed in production in July, 1931. Development was concluded in March, 1941. The lease had produced approximately 1,500,000 barrels to December 31, effective date of the sale.

East Texas

Rusk County Wildcat May Produce from the Pettit

The Rusk County wildcat of N. H. Wheless Drilling Company on the J. M. Walker 470-acre tract, Alfred G. Walling survey and 9 miles northeast of Henderson, will set pipe to try for completion of the Pettit after an electric log indicated possible oil and gas production at 7099-7120 feet with water at 7133-73 feet. The Pettit was entered at 6968 feet with elevation of 394 feet, and the prospect is bottomed in the Travis Peak at 7309 feet.

Beacon Oil & Refining Company and American Liberty Oil Company, S. Brown 1, situated 2000 east by south of their Henderson pool discovery, Rusk County, flowed 171 barrels of 58-gravity distillate and 1,000,000 feet of gas daily through a ¼-inch choke after using 5000 gallons of acid through perforations opposite the upper pay at 7227-35 feet. The flow of distillate doubled the volume developed from perforations at 7244-64 feet in the Pettit, topped at 7220 feet. These two Rusk County deep areas are situated east of the East Texas field and south of the Willow Springs deep gas-distillate pool, Smith County. Skelly Oil Company's Chisum 1, Sand Flat Prospect that passed up oil production from the Paluxy and Rodessa zones, fulfilled the depth contract at 10,005 feet in the Travis Peak, topped at 9947 feet, according to the driller's call. This pending discovery may be carried to 11,000 feet to explore the Travis Peak before pipe is set for completion. Sun Oil Company's Patterson 1, situated 3300 feet west by south of Chisum 1, entered the Woodbine at 4946 feet. Sohio Producing Company's Wright 1, near the north line of the county encountered water in the Paluxy, topped at 7120 feet, and was drilling at 7290 feet.

Manziel Pool: Shell Oil Company's Whatley 1, southeast outpost for the Paluxy oil area, halted at 8806 feet to make an electrical survey which indicated the best oil porosity and saturation in the Pettit at 8760-68 feet. It is due to be carried to the Travis Peak.

Smackover Projects: A. G. Hill et al's Anderson-Magnolia 1, situated on the Calvert faulted structure, Robertson County, was drilling dry hard sand at 8217 feet, having penetrated more than 1200 feet of Travis Peak series. This is the first Smackover exploration in the lower portion of the East Texas Basin. In Morris County, Humble Oil & Refining Company's Wright 1 was drilling Buckner at 10,805 feet. Brown & Wheeler's Gibson 1, Navarro County, was drilling at 6020 feet.

Wood County: Moncrief Bros. and Ed. Hyde's Simmons 1, mile northeast of Golden, was drilling at 6370 feet in Georgetown, topped at 6040 feet. This wildcat failed to maintain its favorable structural position after entering the Woodbine. Roeser & Pendleton's White 1, mile west of Mineola, was drilling Basal Woodbine at 6575 feet and considered low for the area. Plains Production Company's Cox 1, Alba area, was drilling sand at 8995 feet in Pettit, topped at 8675 feet.

Quitman Field: Amerada Petroleum Corporation and Gulf Oil Corporation's White 6, J. Robbins Survey, failed to encounter sand in Paluxy before entering water at 6340 feet with elevation of 442 feet, and abandoned at 6368 feet. This is sixth failure for the field.

Henderson County: L. O. McMillan et al's Ella Warren 1, Eliza Edwards Survey, has started operations on a Woodbine contract, and will be the fifth test for the Henderson-Anderson County block assembled by Pete Wiggins, Jr., Ed. Hyde and Continental Oil Company. The latter partnership drilled three failures then farmed out acreage to McMillan et al.

Texas Gulf Coast

New Oil Field Opened In Wharton County

Seaboard Oil Company is opening a new oil field 6 miles south of El Campo in Wharton County where the company's Duson 1 recovered around 1400 feet of pipe-line oil on a drill-stem test of 10 minutes duration at 6145-50 feet with 2400 pounds bottom-hole pressure. Drill-stem tests also were made at 6150-55 feet and 6155-60 feet, all showing about the same amount of oil as the first test. The sand is the Frio and immediately below the oil sand is a shale bed. Operators now are making a flow test.

This discovery is ETRR survey, A-118, 4½ miles northeast of Danevang. The company has approximately 7800 acres in the block. Sun Oil Company has a 120-acre south offset while Cox & Hamon have a small tract ½ mile north.

Harris County: Sun Oil Company is still making production tests in Hirsch 1, wildcat in the Huffman area, James H. Isbell survey. The well was last perforated at 8480-90 feet and flowed 1 barrel of fluid per hour, 25 percent being oil and the remainder salt water, through ⅛-inch choke. The hole is bottomed at 8821 feet in shale with 5½-inch casing set near bottom. The sand is the Cook Mountain.

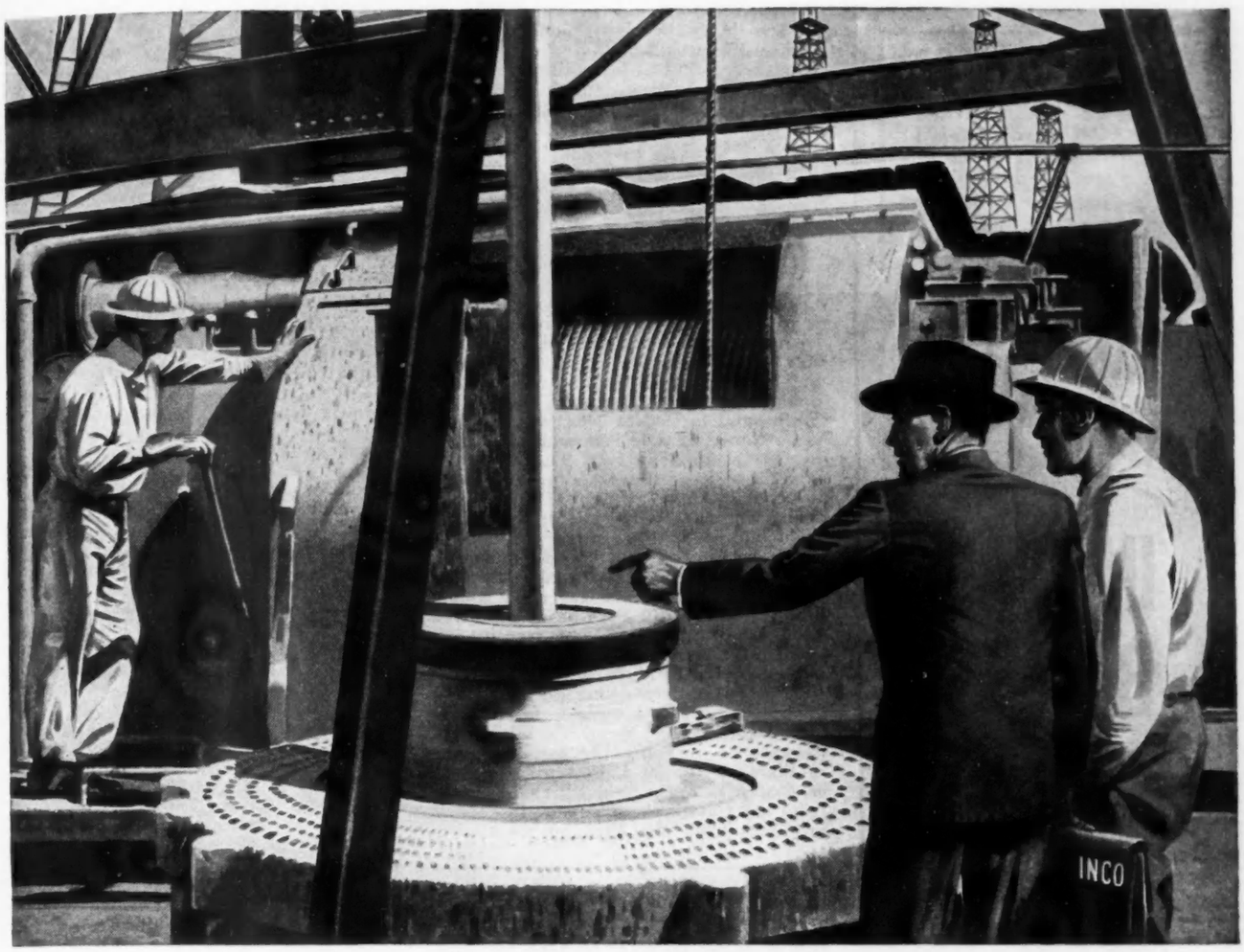
Austin County: Pan American Production Company is whipstocking to sidetrack Austin College 1, deep wildcat on the southwest flank of Raccoon Bend field. The sidetracking will be done around 7100 feet for a retest of the upper Wilcox sands around 7300-15 feet. Last test was made in perforations at 7300-12 feet and 7318-28 feet, but some pipe was lost in the hole while making a squeeze job and the junk could not be recovered.

Also on the Wilcox trend but 3 miles northwest of Columbus in Colorado County, Jack W. Frazier is still fishing at 8035 feet in Gay 1. This well is credited with picking up some encouraging sand shows in Wilcox.

Southwest Texas

Major Extension Looms For Agua Dulce Field

A new sand and a major extension is indicated for the east flank of the large Agua Dulce field, Nueces County, with an extension well recovering 14 stands of oil on a 20-minute drill-stem test. The well is Simmonds & Perry's Fee 2. Hole was drilled to 7403 feet and tested at 7327-32 feet. The well flowed the 1500-foot water cushion and then the



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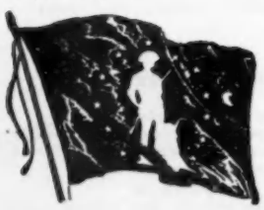

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THE OIL WEEKLY

oil with 175 pounds working pressure.

This well apparently will open one of the deepest oil pays in the field. It is 8500 feet south of production in the same level and is 1½ miles east of shallower production. Operators only recently drilled Fee 1, but it was believed to be too high on structure and made a gas-condensate well. Fee 2 was drilled 3000 feet southeast of the first test in NW NE NE of Section 1, Simmonds & Perry subdivision, Puenticitas Grant.

New Pay: Taylor Refining Company is expanding the Cadena field of Duval County with Garcia 4 flowing 82 barrels daily through 9/64-inch choke, casing sealed, from a sand at 3462-67 feet. The oil is 34.6 gravity. This new pay is 2630 feet south of Garcia 3 which opened production in the 4274-foot level. With sand topped at 3462 feet, the hole is bottomed at 6245 feet and 7-inch casing is set to 3525 feet. The new well is southwest of the older production.

Brooks County: Humble Oil & Refining Company perforated in one of the gas sands in Scott & Hopper 1, wildcat discovery of the Scott & Hopper field, at 6584-92 feet and flowed estimated 6,000,000 cubic feet of gas daily and a spray of distillate. Previously pipe had been perforated at 6878-87 feet in one of three oil sands and the flow was 178 barrels daily through 3/16-inch choke with 700 pounds working pressure. The gas-oil ratio was low and the oil was 41.3 gravity. This discovery, which has indications of being the largest strike in the area for 1943, is 4 miles northeast of Alta Mesa field which produces from the Catahoula. The new discovery produces from the Vicksburg.

South Louisiana

New Test Being Made in Vermilion Parish Wildcat

Union Oil Company of California is making a new test in State-Whitelake 1-A, wildcat in White Lake area of Vermilion Parish. This well, which is opening a new gas-distillate field and possibly oil, was first perforated at 10,618-42 feet and flowed condensate through 5/32-inch choke. The working pressure built up to 3200 pounds while the shut-in tubing pressure mounted to 3900 pounds. Another test was made in perforations at 10,660-675 feet and these holes also showed condensate but the lines froze up. Total depth of the wildcat, in the Lake, T-14s-2w, is 12,000 feet with 5½-inch casing set to 10,768 feet.

New Pay: Union Sulphur Company has opened a new pay sand in the Branch area of Acadia Parish with Andrus 1-A being perforated at 9918-23 feet and flowing 14 barrels of condensate daily through 11/64-inch choke with a large amount of gas. The tubing pressure mounted to 3200 pounds with casing sealed, the condensate being 49.5-gravity.

Humble Oil & Refining Company has announced it will drill another deep test in the Pecan Island area of Vermilion Parish where the company's Louisiana Furs 1 opened a condensate field. The new test is Louisiana Furs 4, Section 3-17s-1e, south of other tests. The discovery well was completed in February, 1943, for 10 barrels of condensate daily and 730,000 cubic feet of gas through ⅛-inch choke from 147 holes at 10,832-47 feet. The second test was completed as a gas producer at 7515-30 feet and the third well was completed as a distillate producer at 10,279-94 feet.

Barnsdall Oil Company has projected a 10,000-foot test in the Gibson area of Terrebonne Parish with the staking of Kuntz 1, Section 34-17s-15e. Cron and Gracey are contractors.

Michigan

Two Dundee Lime Pools in Prospect

Two new Dundee lime pools are in prospect, evidence of a good deep structure in Ogemaw County has been substantiated, and location made for a new 8000-foot Salina gas test in Bay County to close out 1943 with a brighter outlook than under which it opened.

Isabella County: Cities Service Oil Company's Methner 1, SE SW NW 33-16n-3w, Wise Township, a mile south of the old South Wise pool, developed in 1938, logged Dundee lime at 3640 feet and cored a pay at 3691-97 feet. A drill-stem test showed gas in 6 minutes and 1500 feet of oil in 65 minutes. Casing has been set for 3698 feet for completion in the Dundee horizon. The wildcat showed a 14-foot raise over the closest producing well a mile north and a 10-foot raise over a dry hole a quarter mile east.

Bay County: United Drillers and Producer's Arms 1, S½ SE NW 7-14n-6e, Hampton Township, has swabbed and flowed up to 65 barrels in 24 hours. Production is from Dundee, topped at 2660 feet and bottomed at 2880 feet. It probably will be acidized but at this point is regarded as a pool opener.

Gulf Refining Company has cleared a permit with PAW and the State Geological Survey for Salina 1, SE SE SE 34-15n-4e, Kawkawlin field, a projected 8000-foot gas test and the first follow-up development since the company drilled Bateson 1, S½ SE SE, 2-14n-4e, and completed it at a plug-back depth of 7850 feet in the Salina for 7,000,000 feet gas. The well has been shut in since completion except for periodic tests.

Ogemaw County: Muskegon Development Company's State 1, NW SW SE 29-24n-2e, a half mile northwest of the Rose City discovery well, has produced up to 100 barrels of oil flowing from the Ritchfield lime at 4222 feet after a 2000-gallon shot of acid. From the same horizon the discovery made a top of 26 barrels after acid.

California

Activity Reaches Peak at Close of Year

In a spurt of general activity, California operations reached an all-time peak last week. As the old year passed, locations staked to be drilled went beyond 200. A field check for the week showed 281 wells actually drilling, 59 others rigged up, and 19 outfits shut down. A year ago there were 125 wells drilling, 40 rigged up, 40 idle, and 97 locations staked.

Numerous wildcats are among the locations soon to be drilled, with the number growing each week. Six new exploration projects were announced recently, one each to be drilled in Glenn,

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ROTARY DRILLING EQUIPMENT

Chattanooga, Tenn.

Humboldt and Sacramento Counties, and three in Kern County.

Glenn County: Superior Oil Company has staked a new test, Grant Comm. 1, 13-21-2, in an area eastward from Glenn County gas production.

Humboldt County: British American Oil Producing Company is drilling Mitchell-Dorr 1, 10-3-1, as an initial test of a large block of acreage, said to be the most northerly active well in California.

Kern County: Etienne Lang has begun the first of five wells staked for a comprehensive test of the Shale Hills area. Locations for all are in the central part of the north half of 30-27-19.

Devil's Den area will be tested again in a new try, Blake 1, by L. H. Priest and S. R. DeKalb, NW NW NW 25-25-18.

Los Angeles County: Results of The Texas Company's promising deep test in the Long Beach field are held up temporarily, due to a stuck string of drill stem while preparing for a production test. A re-drill job from about 9300 feet to the bottom, at 10,324 feet will be necessary.

Sacramento County: Standard Oil Company has staked location for a wildcat which is reported as a deep test for dry gas production in the Rio Vista area. Location is in 28-4-3.

J. C. CUNNINGHAM, assistant landman for Humble Oil & Refining Company in West Texas, has been transferred from Midland to Tampa, where he will have charge of lease operations for that portion of Florida.

Oklahoma

Deep Tests Going Deeper; Oil Show in Panhandle

The two most closely watched wildcat wells in the state, both being drilled by The Carter Oil Company, are deepening at critical levels with major objective formations just under the drill. The first of the wells, Cottingham 1, CSE SW 4-7n-3w, on the deep-seated Washington anticline structure in McClain County, detailed by seismograph analysis, is now below 10,495 feet drilling Simpson dolomite with no shows reported. This well is located on one of a number of anticlines in the east edge of the Anadarko Basin where it flanks against Nemaha Ridge.

In the same area and on a feature geologically similar to the above, The Carter Oil Company is drilling Johnson Ranch 1, SW NE 13-8n-4w, McClain County. This well has gone out of the customarily thick Pennsylvanian section and is now drilling Mississippi lime below 9312 feet. Both these tests are in the general area of the new Wilcox sand field opened by Mid-Continent Petroleum Corporation at Harris 1.

Texas County: Slight shows of oil have been encountered in a wildcat test of a structure in the Oklahoma Panhandle area west of major gas production in the Hugoton-Texas Panhandle trend. Gulf Oil Corporation's McCoy 1, NE SW 28-4n-10e, was drilling and coring near 5070 feet after passing the top of Mississippi lime. Shows in the few structures tested in this area have not been uncommon although no commercial production has been developed in the region, except the gas reserve in Permian lime and sands.

Ellis County: Also in the western part of the state, Gulf Oil Corporation's Polin 1, C N½ SW 27-24n-26w, is nearing possible gas zones by drilling near the 2900-foot marker.

Lincoln County: Stanolind Oil & Gas Company's Rohlinger 1, SW SW NE 29-14-4e, found slight shows in Oswego lime at 3875 feet and is rotating ahead. Checkerboard lime was topped at 3183 feet.

Arkansas

Saline County Wildcat Shows; New Pool in Barker

Saline County has another new field in prospect at Pryor & Lockhart's Duncan 1, SEc 35-13s-1w, a wildcat with a geologic location in the southeast corner of Salina Basin. This basin feature has been devoid of production until the recent development of a trend from Lindsborg extended the play into Saline County to account for three relatively small; but not completely developed fields. While many structures in the area have been mapped and drilled, only non-commercial shows were encountered. The present well found saturation in both the Burgess sand and in Mississippi lime with 5 feet of saturation in the former and 2 feet in the latter. Kansas City-Lansing was topped at 1840 and the operator began coring at 2002 feet. Casing is being run to test the shows.

Barber County: Deep Rock Oil Corporation's Skinner 2-B, SWc SE 29-31-14w, southwest of Lake City, is a pool opener in Viola lime with hole bottomed at 4640 feet after topping the formation at 4624 feet. There was some 2550 feet of oil in the hole with the formation untreated, and on pumping test the well made 151 barrels in 16 hours.

Pratt County: Aladdin Petroleum Corporation's Hoeme 1, SW SW SW 20-26-12w, filled 2900 feet with oil from Arbuckle lime at 4292 to 4311 feet, and is testing.

Stafford County: A new pool may be in the making at W. P. Faulkner et al's Welch 1, NW NW SW 10-21-12w, which is testing shows in Arbuckle lime at 3554 to 3564 feet, which showed some saturation. There is a question as to whether or not the saturation was sufficient to make a commercial well.

Kiowa Lease Sale

Sealed bids on leases for oil and gas on federally restricted lands in Oklahoma will be opened January 13 at Kiowa Indian Agency, Anadarko, Oklahoma. Tracts in four counties are being offered, the majority being in Caddo County, where 75 pieces are available. In Comanche County 8 tracts are to be offered, in Stephens County 3 and in Washita County 4 tracts, the total being 12,441 acres.

G. C. BLALOCK, 59, natural gasoline plant maintenance superintendent for Phillips Petroleum Company near Pampa, Texas, died December 27 from injuries received Christmas Day in a plane crash near the plant.

Ice Box Harry

Harry Hopkins has a new refrigerator in his new Georgetown residence. The Good Samaritan hospital of Sandusky, O., pleaded vainly for just such a refrigerator. Yet Ice Box Harry wants "no pussyfooting, no special favors." He objects to "business, cocktail parties and Golf as usual." We might mention, however, that Ice Box Harry enjoyed the cocktail parties in Cairo and Teheran. Military planes flew the wines, hard liquors and fancy groceries to Cairo while the Germans made ready for the coup that sank 17 merchant ships in Bari. The band played Harry's request numbers and his son, Bob, shot anything but Japs and Germans. But oil is ammunition, so it may be OK with Ice Box Harry for our customers to indulge in business as usual. In which case, for supplies and equipment, TRY PELCO FIRST.

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PELICAN WELL TOOL & SUPPLY CO.

SHREVEPORT LOUISIANA

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Houston
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New Iberia
Lake Charles

United States Well Completions

ARKANSAS

Columbia County: Crowe Drilling Co.'s Westley A-2, sw nw sw 7-15-19, pump 220 bbls, td 4392 ft.

Columbia County—Dorcheat - Macedonia: Roberts and Murphy's B. H. Barton 1, 16-18-22, dual completion, sandstone oil 6940 ft, 30 bbls, 16/64-in.

McAlester's Luther Hunt 2, s½ se 15-18-22, sandstone oil 6700 ft, 180 bbls, 18/64-in; sandstone gas 7926 ft, 109 bbls, 11/64-in, td 8600 ft.

Atlantic's Formby Unit 1, 13-18-22, dual completion, oil pay 8886 ft, 68 bbls, 3/16-in; sandstone gas 7886 ft, 80 bbls, 3/16-in, td 8930 ft.

CALIFORNIA

Fresno County—Coalinga: Westates Petroleum Corp.'s Commercial 20, ne se ne 31-19-15, pump no est, 35 ft perf 1928 ft, td 1932 ft.

Fresno County — Kettleman North Dome: Kettleman North Dome Association's 6-34J, sw nw sw 34-21-17, flow 1000 bbls, td 8085 ft.

Kern County—Belridge, South: Atlantic's St. Clair 6, sw ne ne 1-29-21, pump 80 bbls 14-gr oil, 80 bbls wtr, 128 ft perf 1146 ft, td 1147 ft.

General Petroleum's 44-2, sw ne ne 2-29-21, pump 54 bbls 16.4-gr oil, 16 bbls wtr, perf 935-1015, 1100-40 ft, td 1179 ft, pb 1140 ft.

Kern County—Buena Vista Hills: Standard's 21-3D, se se se 3-32-24, pump 50 bbls 27.2-gr, 75 ft perf 2955 ft, td 3396 ft, pb 2962 ft.

Kern County—Kern Front: Standard's 8-6-27, se sw ne 27-28-27, pump 288 bbls oil, 145 wtr, 205 ft perf 2455 ft, td 2630 ft pb 2466 ft.

Kern County—Midway-Sunset: Texas Co.'s 36-31, se nw nw 36-31-22, pump 36 bbls, 252 ft perf 1452 ft, td 1527 ft, pb 1460 ft.

Kern County—Mount Poso: Ring Oil Co.'s Bowles 29-31, ne sw sw 29-26-28, pump 54 bbls 15.6-gr, 25 ft perf 1738 ft, td 1738 ft.

Kern County—Poso Creek: Pacific Western Oil Corp.'s Enas Fee 26, se nw sw 21-27-27, pump 20 bbls 12.5-gr oil, 3 wtr, perf 2070-2110 ft, ldd 2110 ft cp'd 2065 ft, td 2110 ft.

Kern County—Round Mountain: Shell's Jewett 1-19, nw sw ne 29-28-29, pump 214 bbls gross, 308 ft perf 1719 ft, td 1720 ft.

Los Angeles County — Wilmington: Union Pacific's E-42, 6913 ft s 4241 ft e c/l Ford & Anaheim, flow 221 bbls 17.4-gr oil, 80 wtr, 300/610 lbs, perf 2248-2353, 2388-2433, 2505-95, 2624-87 ft, td 2702 ft.

Santa Barbara County—Barsdale: San Marino Oil Co.'s Elkins 1, nw sw nw 7-3-19, pump 60 bbls 28.5-gr oil, perf 1680-1725, 1800-80, 1960-2100, 2145-2244 ft, td 2244 ft.

Santa Barbara County—Gato Ridge: Petrol Corp.'s Magenheimer 1, 1513 ft n 404 ft e nec Rancho Los Alamos, 9-8-32, pump 367 bbls oil, 80 wtr, 1511 ft perf 3997 ft, td 4000 ft.

Santa Barbara County—Santa Maria Valley: Union's Bradley Lands 1-7, sw se sw 25-10-34, pump 425 bbls 14.6-gr oil, 140 wtr, 633 ft perf 5123 ft, td 6499 ft, pb 5126 ft.

Ventura County — Ventura Avenue: Shell's Edison 41, 225 ft n 2245 ft w C.L. No. 11, gas lift 367 bbls 28.5-gr oil, 40 wtr, 542,000 gas, ⅝-in, 100/620 lbs, 630 ft perf 8897 ft, td 8900 ft.

Shell's Edison 42, 685 ft n 2320 ft w C.L. No. 11, flow 1146 bbls 31.5-gr, O.F. 100/750 lbs, perf 9904-91, 10,031-243, 10,286-303, 10,547-933, 11,018-060 ft, td 11,063 ft.

Shell's Taylor 165, 130 ft s 6140 ft w R.C.L. No. 11, flow 1160 bbls, perf 7332-7972 ft, td 7975 ft.

CALIFORNIA WILDCATS

Fresno County—Failure: Amerada's Mendota Irrig. Dist. 53-12, nw sw ne 12-14-16, Jamesan area, abnd 5500 ft.

Los Angeles County—Failure: General Petroleum Corp.'s H. B. Allen 1, se nw sw 12-3-12, Norwalk area, gray sand and shale, abnd 10,360 ft.

Merced County—Failure: Shell's Alberti 75-11, nw ne se 11-10-11, Los Banos area, abnd 4305 ft.

Santa Barbara County—Failure: J. I. Anderson's Elliott 1, 990 ft swly 950 ft nwly nec Ellen Elliott ppty, parallel to ely ppty line, 6-9-32, Sisquoc area, abnd 2450 ft.

NEW MEXICO

Eddy County: Grayburg Oil Co.'s Keeley 9-A, c sw nw 24-17s-29e, flow 504 bbls, 2-in, 3500 gals acid 2850-2939 ft.

Nay Hightower et al's Grier 11, c sw se 31-16s-31e, flow 120 bbls, 2-in, shot 210 qts 3160-3275 ft, td 3297 ft.

Penn-Surgical et al's Miller 2, c nw nw 5-18s-29e, flow 48 bbls, 2-in, shot 650 qts 2285-2663 ft.

Premier Pet. Corp.'s Arnold 2-D, c nw nw 35-17s-30e, abnd 3425 ft.

Valley Ref. Co.'s Hill 1, sw se sw 1-18s-27e, abnd 2404 ft.

San Juan County — Barker Creek Dome: Southern Union Production Co.'s Ute 4, c ne 16-32n-14w, elev 7508 ft, 3,110,000 gas, Dakota sands 3224-33, 3243-85 ft, td 3345 ft.

San Juan County—Picture Cliff: Southern Union Production Co.'s Couzens 1, 1320 ft nsl 1570 ft ewl 18-29n-11w, elev 5756 ft, 1,000,000 gas, sand 1858-90, 1898-1915 ft, td 1957 ft.

SOUTH LOUISIANA

Beauregard Parish—Neale: Magnolia's Frazar 1, 660 s&e of nw se 25-3s-11w, 5½-in 11,463 ft, 167 bbls, 10/64-in, td 11,780 ft.

Cameron Parish — East Hackberry: Union Sulphur's State-Kelso Bayou 1, 1019 n 839 w of s cor Unsurveyed Island, 23-12s-10w, 7-in 6320 ft, perf 5003-17 ft, 85 bbls, 14/64-in, td 6957 ft.

Plaquemines Parish—Garden Island: Texas Co.'s State-Garden Island 68, s 57° 20 mins w fr USCGS Mon "Minnesota" 108-23s-32e, 7-in 5757 ft, flow 154 bbls, ½-in, td 6704 ft.

Terrebonne Parish—Bay St. Elaine: Texas Co.'s State-Bay St. Elaine 5, 2491 s 419 w of ne cor sec 24 in 25-22s-7e, abnd 11,770 ft.

Terrebonne Parish—Gibson: Shell's Kuntz 9, 330 s 0° 53 mins e on wl sec 40 fr nw cor sec 40, thence 2310 n 89° 07 mins e to lcn in 40-17s-15e, 5½-in 9278 ft, perf 9244-49 ft, 340 bbls, 9/64-in, td 9285 ft.

Terrebonne Parish — Northeast Gibson: Shell's Realty Operators 18-B, s 33° 07 mins w 4632 ft on el sec 17 fr ne cor sec 17, th n 56° 53 mins w 594 ft in 17-17s-15e, 5½-in 9540 ft, perf 9493-9504 ft, 398 bbls, 10/64-in, td 9540 ft.

SOUTH LOUISIANA NEW PAY

Acadia Parish—Branch: Union Sulphur's Andrus 1-A, start ne cor sec 51, go 5640 ft se'ly on n'ly line sec 51, th ne at ra in 50-8s-2e, 7-in 9936 ft, perf 9918-23 ft, 14 bbls cond and ungauged gas, 11/64-in, td 10,536 ft.

MICHIGAN

Allegan County—Fillmore: Michigan Devonian's Maatman 2, sw ne se 11-4n-15w, Traverse dry, td 1580 ft.

Bay County—Kawkawlin: Jones & Steuernol's Armman 2, s½ se sw 26-15n-4e, Dundee flow & pump 76 bbls, td 2925 ft.

Gulf's Bauer 2, s½ se se 34-15n-4e, Dundee, flow 75 bbls 19 hrs, td 2885 ft.

Clare County—North Winterfield: Sun's Miltner 1, s½ se sw 1-20n-6w, Dundee, dry, td 3809 ft.

Clinton County—Dallas: Jetter & deKraft's Simon 1, nw sw ne 21-7n-4w, Traverse, swab 16 bbls, td 2471 ft.

Mecosta County—Fork: Columbia Gas & Oil Co.'s Murray 1, s½ ne sw 4-16n-7w, Dundee, dry, td 3855 ft.

Mogul Oil Co.'s Adair 1, s½ sw nw 4-16n-7w, Dundee, flow 128 bbls 21 hrs, td 3831 ft.

Rowmor Corp's Kinsman 1, c ne nw 17-16n-7w, Dundee, td 3954 ft.

Ogemaw County—Rose City: Muskegon Dev. Co.'s State 1, nw sw se, 29-24n-2e, Richfield lime, flow 97 bbls 26 hrs, 2000 gal acid, td 4222 ft.

Ottawa County—New Holland: E. L. Bourrett's Ver Hovern 1, n½ se sw 36-5n-15w, Traverse, pump 34 bbls, td 1540 ft.

Van Buren County—Bangor: A. S. Hoyt's Shugars 1, nw nw sw 21-2s-16w, Traverse, pump 19 bbls, td 1014 ft.

Harris Oil Co.'s Tollar 1, ne ne ne 22-2s-16w, Traverse dry, td 1053 ft.

Van Buren County—New Geneva: W. H. Clock's Kerr 1, nw nw se 13-1s-16w, Traverse dry, td 1123 ft.

Socony Vacuum's Grimes 1, nw ne ne 25-1s-16w, Traverse dry, td 1112 ft.

MICHIGAN WILDCATS

Arenac County—Failure: Don Rayburn's State 1, n½ nw nw 33-20n-3e, Dundee 2915 ft, pay 2974-79 ft, wtr 2980-82 ft, abnd.

Bay County — Hampton Field Discovery: United Drillers & Producer's Arms 1, s½ se nw, 7-14n-6e, Dundee 2660 ft, swab and flow 41 bbls, td 2880 ft.

Leelanau County—Failure: Copeland & Barton's Overby 1, se se ne 5-29n-12w, td 4307 ft.

Roscommon County—Failure: Gordon Oil Co.'s Lyon 1, s½ se sw 8-24n-2w, Richfield 4430 ft, td 4580 ft.

MONTANA

Glacier County—Cut Bank: A. E. Crumley's Tribal-Contract 6, se sw se 29-32n-5w, swab 696 bbls, Cut Bank 2806-60 ft.

Santa Rita Oil & Gas Co.'s Jordan 8, c sl nw ne 18-32n-5w, swab 110 bbls, Cut Bank 2790-2816 ft, td 2820 ft.

Santa Rita Oil & Gas Co.'s Tribal "C" 22, c se sw 10-35n-6w, swab 40 bbls, Cut Bank 2880-2945 ft, td 2947 ft.

Texas Co.'s Fee 3, nw sw ne 31-32n-5w, swab 130 bbls, Cut Bank 2893-3053 ft, td 3063 ft.

Toole County—Kevin-Sunburst: Adlon Oils & Mines' Ward 4, sw nw se 29-35n-3w, 500 gals acid, pump 132 bbls, Ellis-Madison 1747-1755 ft.

SOUTH CENTRAL TEXAS WILDCATS

Guadalupe County—Failure: W. H. Bird's Dibrell 1, 26-ac tr, F. W. Hubert sur 8 mi s Seguin, abnd 2966 ft.

Lee County—Failure: Cowan & Sorey's Peeples 2, 287-ac lse, Joseph F. Johnson Lge, abnd 3608 ft.

Wells Completed in the United States in Week Ended January 1, 1944

Data preliminary and subject to revision. Revised and more complete data on all completions shown in monthly summary of drilling, published in second issue of each month. More detailed data on wildcats published in third issue of each month.

State or District	FIELD COMPLETIONS: New Wells *Oil	Gas	†Input	Dry	Total	Old Wells Deepened	WILDCAT COMPLETIONS *Oil	Gas	Dry	Total	ALL COMPLETIONS: This Week	Last Week	Cumulative: This Year	Last Year
Arkansas	....	....	....	....	....	....	....	....	....	....	....	8	....	1
California	17	....	....	....	17	....	....	....	4	4	21	24	21	17
Colorado	....	....	....	....	....	....	....	....	....	....	....	4	....	3
Illinois	....	....	....	....	....	....	....	....	....	....	....	....	....	36
Indiana	....	....	....	....	....	....	....	....	....	....	....	....	....	5
Kansas	....	....	....	....	....	....	....	....	....	....	....	36	....	22
Kentucky	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Louisiana	....	....	....	....	....	....	....	....	....	....	....	9	....	6
South Louisiana	6	....	....	1	7	....	....	....	....	....	7	9	7	6
Michigan	8	....	....	6	14	....	1	....	2	3	17	11	17	10
Montana	5	....	....	....	5	....	....	....	....	....	5	9	5	12
New Mexico	3	2	....	2	7	....	....	....	....	....	7	4	7	5
New York	13	....	8	1	22	....	....	....	....	....	22	25	22	18
Ohio	3	1	....	....	4	....	....	....	....	....	4	4	4	19
Oklahoma	....	....	....	....	....	....	....	....	....	....	....	28	....	32
Pennsylvania	29	1	14	4	48	....	....	....	....	....	48	50	48	48
Texas	43	3	....	11	57	2	3	1	25	29	88	108	88	80
East Texas	4	....	....	1	5	....	....	....	3	3	8	5	8	4
North Texas	7	....	....	2	9	1	....	....	10	10	20	34	20	27
W. Central Tex.	1	....	....	1	2	....	1	....	1	2	4	8	4	3
West Texas	11	....	....	....	11	1	1	....	1	2	14	21	14	18
Tex. Panhandle	4	....	....	1	5	....	....	....	....	....	5	6	5	7
G. Coast, Upper	6	....	....	....	6	....	....	1	2	3	9	7	9	2
G. Coast, Lower	9	3	....	3	15	....	1	....	4	5	20	15	20	12
Southwest Texas	1	....	....	3	4	....	....	....	2	2	6	11	6	7
S. Central Texas	....	....	....	....	....	....	....	....	2	2	2	1	2	....
West Virginia	1	20	....	5	26	....	....	....	....	....	26	18	26	25
Wyoming	1	....	....	....	1	....	....	....	....	....	1	7	1	2
Total U. S.	129	27	22	30	208	2	3	1	29	33	246	345	246	344

* Includes distillate wells. † Includes salt water disposal wells.

WEST TEXAS

Andrews County—Fullerton: Mid-Continent's Eilers 2, c ne nw PSL 14, blk A-32, flow 1533 bbls, 3/16-in, natural, Clear Fork 6793-7209 ft.

Andrews County—North Cowden: Atlantic Sun's Holt 4-E, c sw se T&P Ry. 8, blk 43, blk 1-N, pump 408 bbls, shot 312 qts 4535-4660 ft.

Cochran County — Slaughter: Bay Pet. Corp.'s Mallet-Humble 12, 580 ft out sw cor lab 20, lge 53, Scurry CSL, flow 831 bbls, 1-in, 10,000 gals acid, td 5012 ft.

Devonian Oil Co. et al's Duggan 39-A, 560 ft out nw cor lab 5, Oldham CSL, lge 55, flow 637 bbls, 2½-in, 12,000 gals acid 5000-33 ft.

Magnolia's Mallet 17-C, 580 ft out ne cor lab 22, lge 53, Scurry CSL, flow 333 bbls, 4500 gals acid 5010-51 ft.

Sunray Oil Co.'s Dean-Ben 1, 660 ft out sw cor lab 5, lge 60, Martin CSL, pump 345 bbls oil, 3.2% wtr, 13,000 gals acid 4800-4949 ft.

Gaines County—Seminole: Skelly's Robertson 3, 2086 ft snl 1874 ft ewl W.T. Ry. 196, blk G, flow 422 bbls, ½-in, 2500 gals acid 5170-5265 ft.

Hockley County—Slaughter: Magnolia's Mallet 15-E, 1450 ft snl 1337 ft wel lab 11, lge 49, Scurry CSL, flow 1318 bbls, 10,500 gals acid 4940-5018 ft.

T. F. Morrow et al's Mallet 53, 580 ft out se cor lab 2, lge 48, Edwards CSL, flow 652 bbls, 10,000 gals acid 4891-4928 ft.

Texas Co.'s Slaughter 146, c lab 70, lge 38, Zavalla CSL, flow 1659 bbls, 11,000 gals acid 4915-5000 ft.

Winkler County—Keystone: M. J. Bashara & Sons' Bashara 5, 1100 ft nsl 330 ft wel of n¼ PSL 24, blk B-3, flow 207 bbls, ½-in, shot 625 qts 3050-3250 ft.

WEST TEXAS OLD WELL DEEPENED

Upton County—McCamey: Stanolind's Burleson 27, 2310 ft n 330 ft w of sw cor GC&SF sec 3, in John Nidever sur, otd 2030 ft, pump 10 bbls oil, 10 bbls wtr, 1000 gals acid 1924-2056 ft, td 2125 ft, pb 2056 ft.

WEST TEXAS WILDCATS

Andrews County—Oil Discovery: Texas Co.'s Mabee 1, 1995 ft nsl 1970 ft ewl G&MMB&A 37, blk 40, T-2-N, elev 2915 ft, Yates 2920 ft, Grayburg 4360 ft, San Andres 4640 ft, swabbed 124 bbls 11 hrs, td 4770 ft.

Gaines County—Failure: Tide Water's Woodley 1, c se se PSL 62, blk AX, elev 3608 ft, Yates 3060 ft, brown lime 4085 ft, San Andres 4610 ft, abnd 5106 ft.

WYOMING

Park County—Elk Basin: Stanolind's TP Elk 11 on 7, sw sw nw 19-58n-99w, flow 2160 bbls, 6⅝-in, Tensleep sand 3934-4140 ft.

SOUTHWEST TEXAS

Duval County—Conoco Driscoll: Continental's Driscoll 84-A, 1000 ft w of 12-A in SK&K sur 447, 12,000-ac lse, abnd 3355 ft.

Duval County—Strake: G. W. Strake's Yates 4, 824 ft fr el 3700 ft fr sl 160-ac porc of 600-ac lse, SA&MG sur 2, abnd 3838 ft.

Jim Hogg County—Colorado: Humble's King Ranch-Colorado 29, 1980 ft fr nl 3960 ft fr wl AB&M sur 42, 640-ac lse, 5½-in 3178 ft, perf 3125-29 ft, pump 36 bbls, td 3180 ft.

Starr County—Lockhart: Lockhart & Davenport's Caffarelli 4, 330 ft fr wl 3850 ft fr sl share 19-C, J. A. de la Garza Falcon porc 80, 1158-ac lse, temp abnd 3913 ft.

SOUTHWEST TEXAS WILDCATS

LaSalle County—Failure: Windsor Oil Co.'s McNeel 1, 3297-ac lse, sec 20, Bland & Nelson subdvn O'Connor Rch, abnd 5505 ft.

Starr County—Failure: Herman and George Brown and J. C. Karcher's Guerra 1, 1000-ac lse, porc 56, 17 mi n Roma, abnd 5004 ft.

TEXAS PANHANDLE

Carson County: Skelly's Schafer 175, 1320 ft snl 440 ft wel se I&GN 196, blk 3, pump 249 bbls, shot 480 qts 3108-98 ft.

Gray County: Cities Service's Heitholt 4, ne nw nw I&GN 152, blk 3, pump 136 bbls, granite-wash 3257-72 ft.

Smith Bros. Ref. Co.'s Harlan 1, 495 ft out sw cor sw H&GN 119, blk 23, elev 2791 ft, abnd in granite 3015 ft.

Stanolind's W. Benedict 1, nw nw ne H&GN 55, blk B-2, elev 3108 ft, pump 216 bbls, shot 206 qts 2924-90 ft, td 2998 ft.

Hutchinson County: Allen & Adams' Jasper 2, 3200 ft nsl 1800 ft fr m/e/e line T. C. Ry. 23, blk M-23, pump 69 bbls, shot 330 qts 3048-3148 ft.

EAST TEXAS

Camp County—Pittsburg: Harry S. Moss et al's Williams 1, 660 ft snl 660 ft fr sel 79.3-ac tr, L. Williams sur, elev 406 ft, Georgetown 4526 ft, Paluxy 5648-6003 ft, massive anhydrite 7140-7324 ft, Rodessa 7410 ft, Pettit-Travis Peak 7958 ft, pump 198 bbls, perf 7955-8074 ft, td 8119 ft.

Wood County — Quitman: Amerada-Gulf's White 6, 1400 ft fr m/e/s 720 ft fr m/e/e lines lse, J. Robbins sur, elev 442 ft, Georgetown 5105 ft, Paluxy wtr 6240 ft, abnd 6367 ft.

Rogers Lacy-Wise et al's Johnson 1-E, 2650 ft ewl 1200 ft nsl, H. Anderson sur, elev 409 ft, Paluxy 6198 ft, sand 6217-6300 ft, flow 972 bbls, ¼-in, perf 6218-96 ft, td 6300 ft.

Shell's Goldsmith-Watson 1, 467 ft snl 774 ft

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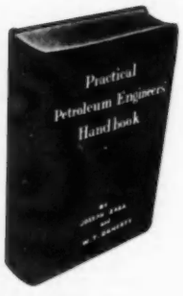
PRACTICAL PETROLEUM ENGINEERS' HANDBOOK

SECOND EDITION—REVISED AND ENLARGED
By JOSEPH ZABA, E.M.M.Sc. and W. T. DOHERTY



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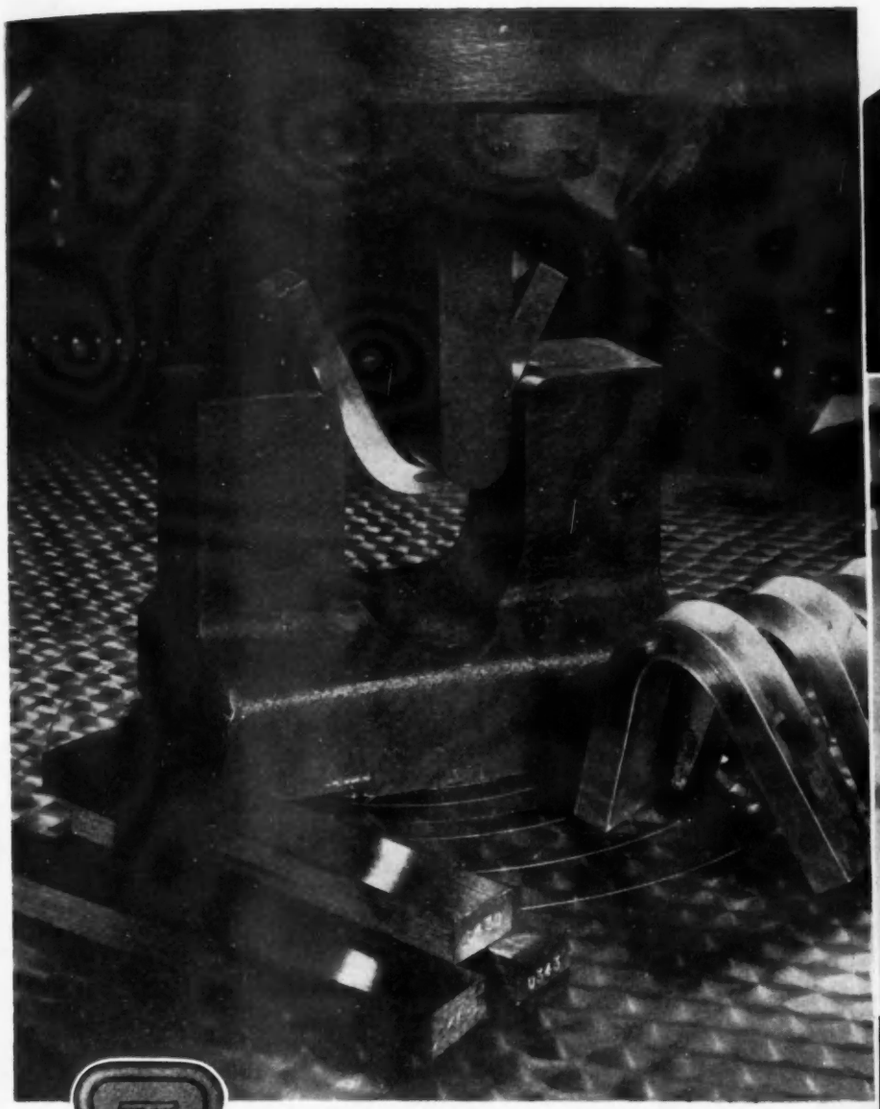

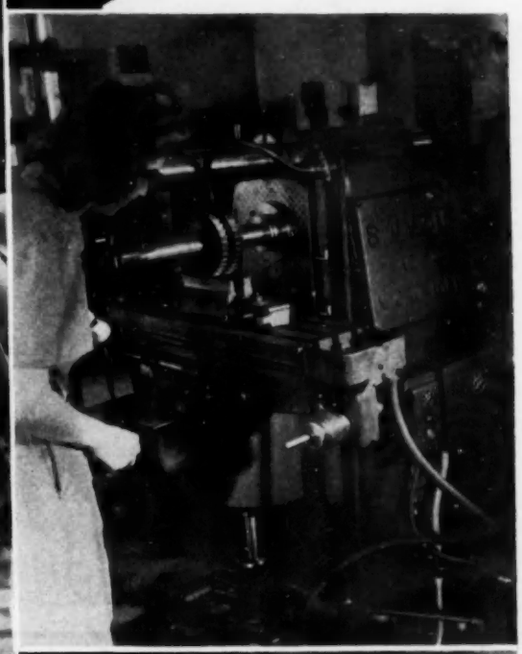

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Bottom right: Shaping the bar and, top right, milling the bar to accurate dimensions. Above: Making the bend test.

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ewl 74.99-ac tr, E. Goodsir sur, Paluxy 6272 ft, flow 551 bbls, ¼-in, perf 6270-6315 ft, td 6490 ft.

Shell's Watson 2, 1720 ft ewl 4690 ft snl, E. Goodsir sur, Paluxy 6296-6330 ft, flow 368 bbls, ¼-in, perf 6298-6328 ft, td 6490 ft.

EAST TEXAS WILDCATS

Henderson County—Failure: L. O. McMillan et al's Gross 1, 330 ft nsl 1300 ft well 91-ac lease, R. P. Tate sur, elev 434 ft, Austin chalk 3950-4350 ft, Woodbine 4763 ft, abnd 4931 ft.

Wood County — Failure: Roy D. Golston-W. J. Collins et al's Riley 1, 5550 ft wel 2500 ft snl, Maria J. Nunez sur, elev 459 ft, Woodbine 4895 ft, Georgetown 5760 ft, Fort Worth 6397 ft, abnd 6505 ft.

Rains County—Failure: Humble's Mainard 1, 660 ft s of m/s/n 660 ft w of m/e/e lines, G. E. Beard sur, elev 375 ft, Georgetown 4950 ft, Paluxy 6068 ft, Massive anhydrite 7450-7600 ft, Pettit 7980 ft, Travis Peak 8156 ft, abnd 8438 ft.

WEST CENTRAL TEXAS

Jones County—Sayles: Condor Pet. Co.'s Sayles 38, 2950 ft nsl 1715 ft wel T&P Ry. 5, blk 20, pump 91 bbls, Flippen lime 1935-43 ft, td 1949 ft.

Shackelford County: C. J. Kleiner & Heltzel's Morris 3, 3630 ft ewl 1330 ft snl E.T. Ry. sec 166, abnd 1915 ft.

WEST CENTRAL TEXAS WILDCATS

Jones County—New Oil Pay: R. H. Roark et al's Winter-Humble 2, 1704 ft ewl 1020 ft nsl T&P 40, blk 18, elev 1818 ft, flow 63 bbls 39-gr, 1-in, natural, Swastika 2986-96 ft.

Jones County—Failure: Texas Co.'s Rogers 1, 660 ft out sw cor, Minter Northington sur 270, abnd 3385 ft.

TEXAS GULF COAST

Brazoria County—Danbury: Rowan Drilling Co.'s Jamison 21, 1296-ac lse, Henry Austin sur 6, w side, 5½-in 4312 ft, perf 2612-18 ft, 80 bbls, ¼-in, td 4813 ft.

Hardin County—Sour Lake: Earl C. Hankamer's McClusky 1, 10-ac tr, Stephen Jackson Lge, lot 17, Oakland subdvn, 7-in 2566 ft, perf 2517-23 ft, 194 bbls, ¼-in, td 2566 ft.

Jefferson County — Lovell Lake: Humble's Steinhagen 9-B, 194-ac tr, William Carr sur, 5½-in 7790 ft, perf 7719-22 ft, 125 bbls, ¼-in, td 7800 ft.

Waller County—Katy: Stanolind-Amerada's Weinman 1, 2440 ft fr sl 1300 ft fr el sec 127, 800-ac unit, slotted pipe 7307-24 ft, 7231-43 ft, 7252-80 ft, flow 50 bbls cond est 28,000,000 gas, td 7320 ft.

Chambers County—Fig Ridge: Sun's Pipkin 4-A, 500 ft fr wl 466 ft fr nl 40-ac unit, 643-ac tr, HT&B sur 96, 5½-in 8600 ft, perf 8480-8500 ft, 379 bbls, 12/64-in, td 8600 ft.

Matagorda County—North Bay City: Ohio Oil Co.'s McDonald 3, 1000-ac lse, J. Betts Lge, 5½-in 8793 ft, perf 7870-75 ft, 197 bbls, ⅛-in, td 8807 ft.

TEXAS GULF COAST WILDCATS

Brazoria County—Discovery: Stanolind-Humble's South Texas Rice 1, 400-ac tr, Day Land & Cattle sur, 7-in 9000 ft, perf 8970-76 ft, 2,500,000 gas, ¼-in, shut in, td 9711 ft. Opens east flank Danbury field.

Waller County—Failure: Jack W. Frazier and Victor Prassel's Hempstead Townsite 1, 40-ac unit, ne¼ blk 481, abnd 5059 ft.

Tyler County—Failure: Humble's Goolsbee 1-C, 100-ac lse, J. B. Flieller sur, 2 mi nw Warren, abnd 7725 ft.

Galveston County — League City: Phillips' Lobit 7, 470-ac tr, blk 5, orig comp 4-16-40, dual comp, 7⅝-in 9285 ft, perf 8959-63 ft, 161 bbls, ⅛-in; perf 8690-92 ft, 209 bbls, ⅛-in, td 9302 ft.

Jefferson County — Stowell: Texas Co.'s Steele-Schmucker 1, 40-ac unit, nw¼ blk 16, comp 6-1-43, dual comp, 5½-in 7843 ft, perf 7585-93 ft, 347 bbls, 12/64-in; perforated 7833-43 ft, 382 bbls, 12/64-in, td 7845 ft.

LOWER TEXAS COAST

Bee County—Mineral: Cities Service Bast 1, 1980 ft fr wl 660 ft fr sl 127-ac lse, Thomas Pilkington sur, 5½-in 7637 ft, perf 7430-45 ft, flow 50 bbls dist, 5/16-in, td 7637 ft.

DeWitt County—Slick: Superior's Kerlick 1, 330 ft fr sw&sel 240-ac lse, Marcus Sewell sur, 7-in 7614 ft, flow 332 bbls, ¼-in, td 7617 ft.

Fayette County—Cistern: Joe S. Mallard's Thiede 1, 467 ft fr n&el 160-ac lse, James Robinson sur, abnd 1300 ft.

Jackson County—Collier: Magnolia's Classen 1, 330 ft fr se&swl lot 21, James Kerr Lge, abnd 4907 ft.

Jackson County—Ganado: Humble's Branch 10, 669 ft fr el 1660 ft fr nl 1809-ac lse, GF&MT Simons sur 2, 5½-in 5500 ft, perf 5430-40 ft, flow 64 bbls, ⅛-in, td 6750 ft.

Jackson County — West Ranch: Humble's Toney 8-B, 5915 ft nw'ly alg nel fr e cor 495-ac lse, R. Musquez Gr, 5½-in 5705 ft, perf 5537-52 ft, flow 89 bbls, ⅛-in, td 5715 ft.

Jim Wells County — North Alice: W. L. Goldston's Reed & Lindsay 3, 330 ft fr sl 3360 ft fr el 1358-ac lse, Lavaca Gr, 5½-in 5473 ft, perf 5415-30 ft, flow est 40,000,000 gas, spray dist, shut in, td 5473 ft.

W. L. Goldston's Reed & Lindsay 4, 1415 ft fr s'ly nl 3518 ft fr wl 1358-ac lse, Lavaca Gr, dual completed, 5½-in 5565 ft, perf 5240-63 ft, 5490-5500 ft, flow gas, no gauge, shut in, td 5575 ft.

Jim Wells County—Ben Bolt: Bridwell Oil Co.'s Smith 9, 1320 ft fr s&wl 676-ac lse, La Trinidad Gr, abnd 5552 ft.

Kleberg County—Stratton: Humble's King Ranch-Paso Ancho 33, 3300 ft fr nl 4750 ft fr el, Santa Gertrudis Gr, 6350-ac lse, 5½-in 6573 ft, 119 bbls, ¼-in, td 6588 ft.

Nueces County—Baldwin: Magnolia's Baldwin 14, 2058 ft fr nl 1678 ft fr el, J. S. McGregor sur 39, 5½-in 3940 ft, perf 3887-91 ft, 420 bbls jetting, td 3940 ft.

Nueces County — East White Point: Sinclair's State-Nueces Bay 3 (974), 330 ft fr w'ly el 220 ft fr w'ly nl tr 974, 235-ac lse, dual comp, 5½-in 5975 ft, perf 5595-5603 ft, 130 bbls, ⅛-in, perf 5810-20 ft, 119 bbls, ⅛-in, td 6017 ft.

Nueces County — Stratton: Tom Graham's Browning 3-A, 467 ft fr n&wl frac sw¼ sec 166, e flank, 5½-in 6700 ft, dual comp, perf 6544-54 ft, 117 bbls, 9/64-in; perf 6632-40 ft, 196 bbls, 9/64-in, td 6700 ft.

LOWER TEXAS COAST WILDCATS

DeWitt County—Failure: Adams Oil & Gas Danysh 1, 107-ac lse, J. McDermott sur, 1 mi se Yorktown, abnd 8817 ft.

Hidalgo County—Failure: E. A. Showers' Fee 1, lot 4, blk 19, Vista Hermosa subdvn, porc 79-80, 5 mi nw Mission, abnd 6507 ft.

Jackson County—Failure: John C. Wynne's Mauritz Bros. 1, w 40-ac of s½ blk 3, Bartell subdvn, John Davis sur, abnd 6511 ft.

Karnes County—Discovery: Arkansas Fuel's Lyons 1, 662 ft fr ne 648 ft fr sel, D. C. Lyons sur, 2½ mi s Runge, 130-ac lse, 5½-in 6779 ft, perf 6595-6610 ft, 138 bbls, ¾-in, td 8020 ft, opens Runge field.

Nueces County — Failure: Henshaw Bros. Bevly 1, 330 ft fr s&wl blk B, Cody subdvn, sur 166, 72-ac lse, td 3253 ft.

LOWER TEXAS COAST EXTENSION

San Patricio County—Taft: Republic Natural Gas Co.'s Hancock Insurance 1, 467 ft fr el 1980 ft fr sl 1557-ac lse, T. T. Williamson sur, 1 mi w of prodn, 5½-in 4939 ft, perf 4913-16 ft, 82 bbls, ⅛-in, td 4939 ft.

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Despite higher taxes and prices, the average worker still has more money than ever before—particularly on the basis of the *family* income. With others in the family earning, too, just let the worker 'figure it out for himself', and he usually will realize that *now* he can put more into War Bonds than he has been doing.

That's why the Treasury Department has set new quotas for the current Pay-Roll Allotment Drive—*quotas running about 50% above former figures.* These quotas are designed to reach the *new* money that's coming into the family income. Coming from millions of new workers . . . from women who never worked before . . . from millions who never before earned anything like what they are getting today!

The current War Bond effort is built around the *family* unit, and the Treasury Department now urges you to organize your War Bond *thinking*—and your War Bond *selling*—on the basis of your employees' *family* incomes. For details, get in touch with your local War Finance Committee which will supply you with all necessary material for the proper presentation of the new plan to your workers through your labor-management committees.

Today about 30,000,000 wage earners, in 175,000 plants, are buying War Bonds at the rate of nearly half a billion dollars a month. Great as this sum is, *it is not enough!* So turn-to today! Get this new *family income plan working!*

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By PHILIP B. KING

Geologist, Geological Survey, United States Department of the Interior, Washington, D. C.

PUBLISHED BY PERMISSION OF THE DIRECTOR OF THE GEOLOGICAL SURVEY AND OF THE SECRETARY OF THE GEOLOGICAL SOCIETY OF AMERICA.

REPRINTED FROM THE BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, VOLUME 26, NUMBER 4 (APRIL, 1942)

FOREWORD BY RONALD K. DeFORD AND E. RUSSELL LLOYD

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Chapter One—Introduction
Chapter Two—Guadalupe Mountains Section
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LOWER TEXAS COAST NEW PAY

San Patricio County—South Sinton: Seaboard Oil-Tide Water's Hellan 1, 467 ft fr wl 2170 ft fr sl 811-ac tr on 5000-ac lse, Eaton subdvn, Malcolm McAuley sur, 5½-in 3368 ft, perf 3260-85 ft, flow dry gas, shut in, td 6715 ft.

NORTH TEXAS

Archer County: M. W. Blair Oil Co.'s Henry 5, 1400 ft snl 3190 ft wel sec 35, blk 5, Clark-Plumb sur, pump 75 bbls, 928-35 ft.

Geo. W. Cooper et al's Parkey 2, s sw se S.P. Ry. sec. 1, A-419, abnd 4379 ft.

Clay County: Geo. Golden et al's Enyart 1-B, 200 ft fr nel 1050 ft fr sel lot 7, Thornberry sur, pump 10 bbls, 1111-21 ft.

Texas Co.'s Harsard 12, 1500 ft fr sel 200 ft fr nel lot 1, Thornberry sur, pump 53 bbls, 1068-88 ft.

Jack County: Chas. H. Kadane et al's Carter-Shell 16, 1760 ft ewl 565 ft nsl TE&L Co. sec 3312, pump 10 bbls oil, 2 bbls wtr, 265-271 ft.

Montague County — Mueller: Continental's Miertschien 1, 330 ft fr sel swl of 89.3-ac lse, W. A. White sur A-1587, Bend 6006 ft, Viola 6656 ft, Simpson 6840 ft, Ellenburger 7381 ft, abnd 7462 ft.

Wichita County — Airport: Consolidated's Michna 1, 523 ft snl 495 ft wel blk 3, Cherokee CSL, KMA 4267-90 ft, Ellenburger 5319 ft, pump 30 bbls oil, 100 bbls wtr, Strawn perf 4405-25 ft, td 5403 ft.

Wichita County — Davidson: Consolidated's Williams 2, 495 ft out se cor blk 3, Cherokee CSL, Bend 5204 ft, Ellenburger 5307 ft, flow 776 bbls, ¾-in, natural, perf 5307-17, 5344-51 ft, td 5352 ft.

Young County: Trumter Oil Co.'s Clark 12-A, 300 ft nsl 850 ft wel nw TE&L Co. 218, pump 36 bbls, 878-884 ft.

NORTH TEXAS WILDCATS

Archer County—Failures: M. W. Blair Oil Co.'s Prideaux 1, 550 ft nsl 150 ft wel, F. Saunders sur A-855, abnd 980 ft.

Cochran & Cain's Forester 1, 330 ft out sw cor blk 46, Harris Club Ranch subdiv, abnd 1412 ft.

White & Duncan's L. Kinder 1-57, 330 ft ewl 800 ft snl sec 57, blk 5, Clark-Plumb sur, abnd 1340 ft.

Frank Wood et al's Abercrombie 1, 1200 ft snl 550 ft ewl, M. Hutchinson sur blk 105, A-171, abnd 1408 ft.

Valley Osage Oil Co.'s Turbeville 1, 1320 ft snl 200 ft ewl blk 28, Jefferson CSL, abnd 1136 ft.

Clay County—Failure: Geo. Keith Jr. et al's McCarty 1, 1020 ft ewl 300 ft nsl blk 46, Specht-McCutchen sur, abnd 1556 ft.

Jack County—Failure: Hanlon & Buchanan's Johnson 1-J, 495 ft out sw cor 131½-ac tr, John O'Neal sur A-455, Mississippi 5645 ft, Ellenburger 5810 ft, abnd 6084 ft.

Montague County—Failure: Gulf's Haggard 1, 467 ft wel 1607 ft snl TE&L Co. sec 2863, Simpson 6765 ft, Ellenburger 7125 ft, abnd 7255 ft.

Wichita County — Failure: W. A. Baber et al's Preston 1, 200 ft n 2075 ft e of ne cor, N. Selines sur A-261, but in John Deck sur A-52, abnd 1425 ft.

Young County—Failure: L. V. Hull et al's Sparks 1, 480 ft out sw cor TE&L Co. sec 232, abnd 1049 ft.

NORTH TEXAS WILDCAT DEEPENED

Montague County—Failure: J. O. Hayes et al (was Guard S. Marvin's) Lemmon 1, M. Burnside sur A-14, otd 1780 ft, abnd 2597 ft.

Pouce Coupe Field May Develop Into Canada's Best

Not very much has been said or written about the new Pouce Coupe field, only 20 miles from Dawson Creek, British Columbia; but it is beginning to show promise of really major proportions. A 5,000,000 cubic foot gas well has been brought in there by Alaska Highway Company, on one of the biggest and best "textbook" structures on the continent. Every porous zone so far encountered in test wells has carried oil or gas, or both, and large oil seepages have been found along a 10-mile stretch of the Pouce Coupe River, which cuts through the area and has eroded a considerable section of bedrock. New wells are planned for locations down-structure from the big gas well, which has been closed in for lack of a market for the gas. The closing-in of any such gas wells in the new field, will, of course, conserve the reservoir pressures of pays, of which four are so far proved.

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Humbolt County: British American's Mitchell-Dorr 1, 10-3-1, Eureka area, lcn.

Kern County: L. R. Priest & S. R. De Kalb's Blake 1, nw nw nw 25-25-18, Devils Den area, lcn.

Texas Co.'s Bowerbank Unit II 8B, c sw ne 8-29-24, Bowerbank area, mlm.

Tide Water's Olcese 1-21, se ne ne 21-28-29, Round Mountain area, lcn.

Dwight G. Vedder's 2-18, nw nw se 18-27-28, Mt. Poso area, dr.

Dwight G. Vedder's 3-18, se nw se 18-27-28, Mt. Poso area, lcn.

Los Angeles County: Tide Water's Downey 10-1, ne nw se 4-31-2, Downey area, lcn.

SOUTH LOUISIANA

St. Martin Parish: Howard Youree's Ruth Sugar 1, n 54° e 1150 ft, th s 36° e 50 ft fr nw cor 93-9s-62, lcn.

MICHIGAN

Allegan County: Southwest Dev. Co.'s MacDougall 1, ne se ne, 23-2n-12w, lcn.

Newaygo County: Fisher-McCall's Schlatter 1, n½ nw se 30-14n-14w, rig.

WEST TEXAS

Fisher County: Northern Ordnance's Green 1, c ne sw H&TC 286, blk 2, dr 3260 ft.

Lynn County: Sohio Producing Co.'s Rinne-Honolulu 1, c se sw BS&F sec 262, blk Z, lcn 6000-ft test.

WEST CENTRAL TEXAS

Coleman County: Phillips' Ballard 1, 3804 ft wel 4235 ft nsl, D. W. Cloud sur, 4 mi n Coleman, mlm 3700-ft test.

SOUTHWEST TEXAS

Duval County: Taylor Refining Co.'s Sepulveda 1, 173-ac lse, BS&F sur 297, lcn.

McMullen County: Atlantic's Atkinson 1, Loma Alta area, 1280-ac lse, Martha J. Dean sur 13, lcn 9000-ft test.

S. F. Hurlburt's Countiss 1, 700 ft fr nwl 5500 ft fr nel, Mrs. Ben J. Hughes sur 836, blk 118, 12 mi nw Tilden, lcn 6500-ft Wilcox test.

Edwin M. Jones' Ezzell 2-C, sec 54, Ezzell Rch, blk 87, lcn 7500-ft test.

Webb County: J. B. Burton's Bruni 1, 320-ac lse, C&M sur 447, 6 mi s Bruni, lcn 2000-ft test.

LOWER TEXAS COAST

Brooks County: Standard of Texas' Garcia 4, 3437 ft fr w'ly el 2447 ft fr s'ly sl 2161-ac tr, La Encantada Gr, 1½ mi se Alta Mesa field, lcn.

Cameron County: Great Lakes Carbon's Yturria Land & Livestock 1, 747 ft fr ne 803 ft fr swl lot 25, Santa Isabel Gr, 6616-ac lse, lcn 11,000-ft test.

Goliad County: Amerada's McFadden 1, Hoard's Creek area, 2527-ac lse, Pedro Trevino sur, lcn 11,000-ft test.

Lavaca County: Robert T. Wilson's Quota 1, 482-ac lse, John Douglass sur, 3 mi se Sweethome, lcn 8000-ft test.

San Patricio County: Texas Conservative's Gaines 1-B, 240-ac lse, 2 mi n Odem, blk 17, lcn 5500-ft test.

NORTH TEXAS

Cooke County: J. D. Caviness et al's John Kubicek 1, 330 ft out ne cor of sw-40 ac of 174-ac tr, John Gregg sur, lcn 2000-ft test.

Wichita County: Sohio Prod. Co.'s Nolen 1, 330 ft nsl 2315 ft wel, John Thomas sur A-283, lcn 6000-ft Ellenburger test.

Wilbarger County: Texas Co.'s Bankers Life Ins. Co. 1, 2000 ft snl 3300 ft ewl, John Cox sur A-541, mlm 5500-ft test.

WYOMING

Hot Springs County: Goodstein et al Mountain State Power 3, c sw sw 11-46n-99w, Little Grass Creek, mlr.

Continental's Unit 1, c se ne 11-46n-99w, dr 2640 ft.

TEXAS GULF COAST

Brazos County: Phillips' Weems 1, 289-ac lse, J. M. Barrera sur, 2 mi nw Millican, lcn 4000-ft test.

Montgomery County: Texas Co.'s Sealy & Smith 1, 2½ mi e Dobbins, 409-ac lse, William Rankin sur, lcn 10,500-ft test.

San Jacinto County: Stanolind's Roberts Co. 1, 518-ac lse, Uriah Gibson sur, 3 mi sw Shepherd, lcn 8500-ft test.

EAST TEXAS

Hopkins County: Sonac-Texas O&G's R. S. Stubbs 1, 531 ft snl 813 ft wel 55.4-ac tr, Thomas Lee sur, lcn Paluxy test.

Leon County: W. L. Durham et al's Jake Watson 1, 450 ft fr nwl 11,000 fr nel Jose M. Viesca sur, 4 mi sw Flynn, lcn 8000-ft test.

Shell Film Pays Tribute To Petroleum Engineer

A new educational film, "Flight Log," which tells of the part the petroleum engineer has played in the development of aviation, was pre-viewed recently by 370 employees of the head office of Shell Oil Company, at a luncheon held at the Plaza Hotel, in New York. Mrs. James H. Doolittle, wife of flying Major General "Jimmy" Doolittle, addressed the gathering and introduced the film, stressing the importance to today's flying men of 100-octane gasoline. Those present at this annual service luncheon numbered nearly 4000 years of affiliation with the company. Doolittle has been a member of the Shell organization since 1930, and is at present on a leave of absence.

The picture traces the history of aviation from forty years ago when the Wright brothers made their flight at Kitty Hawk. It is a tribute to the collaboration of the airplane designers, the engine manufacturers and the petroleum scientists.

President Signs Law Extending Oil Leases

Legislation extending expiring oil leases on the public lands, to protect the interests of the lessees, was signed by President Roosevelt December 23.

The bill extends until December 31, 1944, expiring leases which otherwise would not be subject to renewal because the lands now are within the boundaries of producing oil or gas fields.

Generator Plants

Master Vibrator Company, Dayton, Ohio, has issued a new 40-page engineering manual containing information on portable gas-electric generator plants.

This manual includes simplified explanation of power factor, load factor, mixed loads, power calculations and other data. It is illustrated with photographs, drawings, diagrams and tables. In addition there are construction views and complete specifications of 19 portable gas-electric generating plants with valuable information on accessories.

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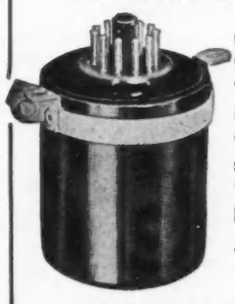

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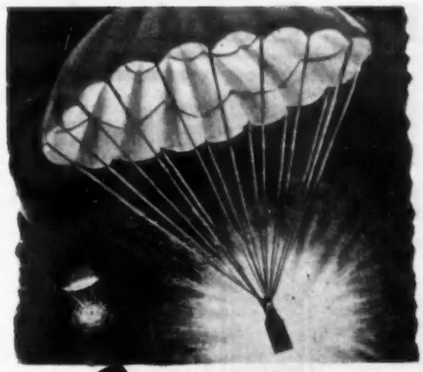

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THOSE SHORT PIECES OF

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Pieces of old rope make signal flares when used as scrap. For this purpose, our government needs pieces of old manila rope—pieces too short to be of use to you. Send all you have to your local Salvage Board. It will be put to work in the war.

You can further help by taking care of the rope you already have. Treat it with care, for by making old rope last, you are releasing new rope to those who need it most—our fighting forces.

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Squeaks from the Bull Wheel

Two of Them

A girl turned up wearing two silver bars pinned to her sweater.

"Is your boy friend a captain?"

"Goodness, no! Two lieutenants."

Those Two Other Guys

"I was going over the bridge when I met Pat Murphy."

"'Pat,'" says I, 'how are you?'

"'Pretty well,' says he. 'How are you, Mike?'

"'Mike!' says I, 'That's not by way of bein' my name.'

"'Faith,' says he, 'no more is mine, Pat!'

"So we looked at each other, and sure enough, it turned out to be naither of us."

Tall Stories

An elderly preacher was stationed in a section where his parishioners didn't have much money for his salary. They did help his budget, though, by inviting him out to dinner. As his presence would make these meals something of an occasion, there would always be chicken on the table—fried chicken, roast chicken, chicken and dumplings, all kinds of chicken.

It so happened after years of these chicken dinners, the old pastor went fishing one day and lost his false teeth in a creek. The clay-colored water quickly covered them and they were lost to his sight.

Studying the situation a moment, the preacher reached into his lunch-box, took out a chicken bone and tied it to his fishing line. As the bone dropped below the water level, the false teeth sprung from the creek bottom and clamped firmly on it. The preacher then hauled them out with ease.

The Knowing Neighbor

The conception of a gentleman held by the German military mind is illustrated in a story of an encounter between a German officer and a senior member of the British Embassy in Berlin before the outbreak of the present war.

The German officer remarked that the British are gentlemen, but the French are not. Asked to explain what he meant, he said,

"One day in 1920, some of the Military Control Commission under a French and a British officer, came to the barracks of which I had charge. They claimed that they had reports that I had a store of rifles concealed behind a brick wall, contrary to the terms of the Peace Treaty. I denied this. 'I give you my word of honor as a German officer,' I said, 'that I have no rifles concealed in the barracks.'

"Well, your British officer was a gentleman. He accepted my word of honor and went away. But the French officer was not a gentleman. He would not accept my word of honor. He pulled down the wall. And he took away my rifles."

Kindred Spirits

Back in the old days there labored in Washington a negro barber who had seen many senators come and go.

"Uncle," said a lawmaker, when he had settled himself in the old man's chair, "you must have had among your customers many of my distinguished predecessors in the Senate?"

"Yes, suh, I'se knowed most all o' dem. By the way, suh, you reminds me o' Daniel Webster."

"Is it my brow?"

"No, boss, it's yo' breath."

In The Army

How's the water on this god-forsaken island, soldier?

Well, buddy, first we boil it, then we filter it, then we drink beer.

Not So Smart!

The young lieutenant had cornered a very pretty girl at a party and was, naturally enough, trying to impress her with his views of love, life, death, history, civilization and whatnot.

"For instance," he was saying, "one trouble with modern society is that we are too specialized. Now, I happen to have a good background in the liberal arts, but I must confess I haven't the faintest idea of how the radio works."

"My goodness," exclaimed the wide-eyed beauty. "It's easy. You just turn the knobs and it plays."

Portable Electric Blower

Breuer Electric Manufacturing Company, 5100 North Ravenswood Avenue, Chicago, Illinois, announces a new booklet describing the Tornado portable electric blower. The blower is especially recommended for use in cleaning all types of motors, and its adaptability to such jobs is explained in the publication.

Lost Opportunity

"Paw."

"What, son?"

"Why didn't Noah swat them two flies when he had such a good chance?"

Modest

A girl was entertaining her girl friend and was pouring the tea, when her friend spied a full-length nude painting, hung on the wall. "Why, Mabel, that is a painting of you, did you pose like that?" "Why, yes, it's me, but of course I did not pose for it. Mr. R. painted it from memory."

Those Marines

"When we presented arms," said one, "all you could hear was slap, slap, click."

"Pretty fair," said the other. "With us, it was slap, slap, jingle."

"Jingle? What was that?"

"Our medals!"

Her Vice

He: "Do you smoke?"
She: "No, I don't smoke."
He: "Do you drink?"
She: "No, I don't drink."
He: "Do you neck?"
She: "No, I don't neck."
He: "Well, then what do you do?"
She: "I tell lies."

Tsropski

Read the fourth line on the chart.

Read it! Why, I know the guy personally. He used to play football at Fordham.

Notes for the Equipment Buyer and User

Automatic Fuel Cut-Off

COMBUSTION CONTROL CORPORATION

Combustion Control Corporation, Cambridge, Massachusetts, announces "Fireye" Type F28C, a photoelectric system for providing instantaneous fuel cut-off in any pressure-fed burner in the event of flame failure.

Capable of monitoring flame of any intensity, the system is applicable to oil, gas, or pulverized coal burners. The device is actuated by the presence or absence of flame, operates immediately, and consequently eliminates the explosion hazard present when even a few seconds elapse before fuel cut-off.

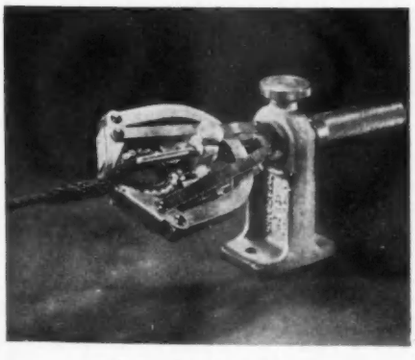
The outfit is used with manually ignited burners to cut off fuel and sound an alarm; or, when the burner is automatically fired, with Program Relay Type R25, to program fuel pump and valve operation, intermittent ignition system, purging period, and recycling.

Designed to operate at relative high ambient temperatures, Type F28C is mounted directly on the furnace wall and watches the flame through a window in the wall of the fire chamber. Once the lens of the optical system has been aligned, the field of vision of the electric eye is limited to the flame itself and extraneous light is rejected. Light from the flame strikes the sensitive plate of the photocell and starts a flow of electrons, producing a minute electrical current. After passing through a vacuum tube, this current is amplified sufficiently to operate a relay which directly controls a solenoid valve governing fuel feed, or "Fireye" Program Relay Type R25, which programs the entire cycle of burner operation. While the electric eye sees flame, "Fireye" feeds fuel to the burner. Should flame fail, or any condition impairing safe operation develop within the electronic control, "Fireye" cuts off the fuel supply until proper combustion conditions are restored.

Cable Splicer

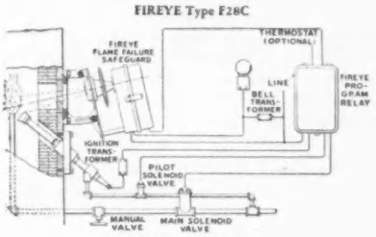
MECHANICS ENGINEERING COMPANY

Mechanics Engineering Company, Box 243, Jackson, Michigan, has developed the improved Universal Splicer for splicing wire cable. The device facilitates splicing by holding cables firmly in the proper position on thimbles or bushings. The sprocket chain adapter is built in, and is instantly adaptable



Universal Cable Splicer

FIREYE Type F28C



Typical FIREYE

Installation For Automatically Ignited Oil Burner

to any size and type of cabe from 1/16- to ¼-inch diameter, using either thimbles or bushings.

The adapter insures good work by providing a firm hold. The sprocket chain automatically grips and snugs the cable around the thimble or bushing when the jaws close, effectively preventing any bulging of the cable strands.

The splicer is built of wrought iron, with manganese bronze fittings.

For production jobs the stand of the splicer should be bolted to a bench. For maintenance work the splicer can be removed from the stand whenever necessary or desirable, and held in a vise.

For emergency jobs or whenever it is not convenient to use either the stand or a vise, a workman can hold the splicer.

The splicer can be used on jobs where turnbuckles, couplings, or special fittings have been linked with thimbles or bushings.

Lighting Handbook

Westinghouse Lamp Division, Bloomfield, New Jersey, has issued a 175-page "Lighting Handbook," designed as a practical guide and working reference book for lighting engineers.

A feature of the handbook is a series of charts which coordinate room index, fixture efficiency and coefficient of utilization curves and provide a new and graphic method of determining the desired illumination for various applications. Charts cover industrial and commercial fluorescent and incandescent lighting and provide a means of calculating quickly the number and size of lamps needed with practically every type of lighting fixture.

Copies of the handbook may be secured from district offices of Westinghouse Electric Manufacturing Company, for $1.00.

Electronic Microscope

GENERAL ELECTRIC COMPANY

General Electric Company, 6 State Street, Schenectady, New York, is producing a simplified electronic microscope. The design is said to be unique in that it employs electrostatic lens which do not require accurate voltage regulation. The instrument is housed in a desk design for convenience of operation.

The microscope operates on ordinary house current, and is capable of producing images 10,000 times the size of the specimen. According to the manufacturer, the electronic microscope is ten times more powerful than the best light microscope.

Link-Belt Company Announces Promotions

Link-Belt Company, Chicago, Illinois, announces the following promotions:

E. L. Berry, vice president and general manager of Link-Belt Ordnance Company, has been elected vice president of Link-Belt Company, the parent organization. Berry, who began his Link-Belt connection in 1914, has for many years devoted his time particularly to matters of production and personnel. His new headquarters will be at the company's general office in Chicago.

Richard F. Bergmann, chief engineer, has been elected a vice president, with headquarters at the company's general office, Chicago, as heretofore. Bergmann came to Link-Belt in 1924, through the purchase of Howe Chain Company.

John E. Martin has been appointed manager of Link-Belt Ordnance Company, with headquarters at the plant. Martin joined Link-Belt in 1927, and since Pearl Harbor has been assistant to Brigadier General G. M. Wells, War Department, at Washington.

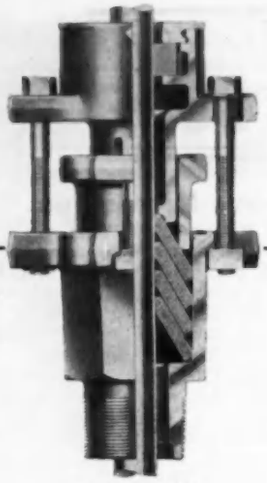
Wilson-Snyder Awarded Second Gold Star

Wilson-Snyder Manufacturing Division of Oil Well Supply Company, has been awarded a second gold star to be added to the Maritime M which the company received last year for outstanding production achievements of war materials. The plant is located at Braddock, Pennsylvania.

Wire Rope Buyers' Guide

Macwhyte Company, Kenosha, Wisconsin, has issued a new wire rope buyers' guide, known as G-15. The guide has a tabbed index with contents to each section printed on each index, plus a general index. Also there are 60 pages of helpful information on conservation and care of wire rope. In addition there are the latest tables and information in accordance with new simplified practice on wire rope.

FRANK WOOD, sales manager of United Supply Company, Tulsa, has been made vice president and will continue in charge of sales.



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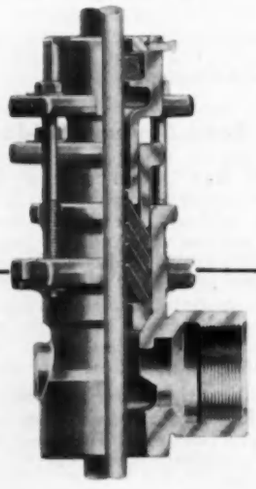
Remember this . . . the ordinary conventional box will use 660 times as much rubber as a Hercules Cone Packed Box to get the same job done. This takes no account of time lost in innumerable shut-downs for repacking the ordinary box. Another thing, Hercules Cone Packed Boxes will not leak, even if well pumps off. Be practical . . . do YOUR part in America's War Effort, by saving rubber, time and oil . . . install a Cone Packed Box TODAY.

HERCULES TOOL COMPANY

TULSA OKLA.

STUFFING BOX - TEE



Men in the Industry's News

JAMES C. GRAVES, of Saginaw, president of the Basin Oil Company, has been elected president of the Oil and Gas Association of Michigan for 1944. Graves, a member of the state oil advisory board and vice president of the association the past two years, succeeds Kurt H. deCousser of Lansing, resident manager of Socony-Vacuum Oil Company, president for 1942 and 1943.

C. W. Teater of Saginaw was elected vice president. All other officers were re-elected, including George Talbot, Talbot Oil Company, and W. P. Clarke, Gulf Refining Company, both Saginaw, as co-treasurers; W. B. Pardoe, Dapar Oil Company, Grand Rapids, secretary, and Harold McClure, Alma, legislative secretary.

H. A. EKLUND has been advanced from superintendent of the land department of British American Oil Producing Company to vice president in charge of this branch of operation. R. E. Kepke, who has been assistant to H. C. Arnold, vice president, has been promoted to vice president and manager of Toronto Pipe Line Company.

M. D. HOWELL has been appointed as assistant to the president of United States Steel Corporation of Delaware. He will continue as vice president, secretary and treasurer of the Delaware Corporation in addition to his new duties, which will consist of special assignments by the president.

Lloyd Again Heads California Association

California Oil & Gas Association last week elected Ralph B. Lloyd, president of Lloyd Corporation, for a third term as president. Vice presidents chosen to serve during 1944 are A. C. Mattei, president of Honolulu Oil Corporation, and Reese H. Taylor, president of Union Oil Company. C. A. Johnson, president of Holly Development Company, was elected treasurer. F. E. Foster continues as managing director and D. S. Kilgour as assistant manager.

Directors elected for 1944 include: Leigh M. Battson, of Robert S. Lytle, operator; S. Belither, Shell Oil Company; James B. Black, Pacific Gas & Electric Company; H. D. Collier, Standard Oil Company of California; R. E. Collom, Continental Oil Company; J. A. Crawford, Youngstown Steel Products Company; S. J. Dickey, General Petroleum Corporation of California; E. S. Dulin, Byron Jackson Company; LeRoy N. Edwards, Southern California Gas Company; E. B. Gilmore, Gilmore Oil Company; Dana Hogan, Hogan Petroleum Company; R. P. Huggins, Western Gulf Oil Company; Wm. F. Humphrey, Tide Water Associated Oil Company; C. S. Jones, Richfield Oil Corporation; W. M. Keck, Superior Oil Company; Wm. Reinhardt, Union Pacific Railroad; F. C. Ripley, Chanslor-Canfield Midway Oil Company; L. P. St. Clair, Independent Oil Producers' Agency; J. B. Sutherland, Ohio Oil Company; C. P. Watson, Seaboard Oil Company of Delaware; Torrey H. Webb, The Texas Company; A. L. Weil; Lee K. Whittier, Belridge Oil Company, and W. C. Whaley, Barnsdall Oil Company.

HEWLETT A. RUSSELL has resigned as geologist for Standard Oil Company of Texas, with headquarters at Graham, Texas, to open an office as consulting geologist. He will continue to live in Graham. Russell has been with Standard Oil Company of California and subsidiaries for the past nine years, serving most of that time in West Texas. He was in California for two years, and also in Mississippi and Alabama for one year, and spent one year in Houston. He graduated from Texas A. & M. College in 1928 and was associated with Herschel H. Cooper, geologist in San Antonio, for a short time, and also with Indian Territory and other companies, for a brief period.

GLENN BISH, manager of the Michigan producing division of Ohio Oil Company, has been appointed a member of the Michigan Oil Advisory Board, to succeed Edward F. Clagett, deceased. E. J. Bouwsma of Muskegon, president of Commonwealth Pipe Line Company, was appointed to succeed Edward J. Stewart, resigned.

JAMES A. TRAIL, oil field representative for Hyatt Bearings Division of General Motors Corporation, is now located at Dallas, Texas. During the past year he has traveled out of Chicago and Detroit handling special assignments in connection with the war effort.

ARNOLD H. BLEYBERG, geologist and paleontologist with Fohs Oil Company, has been appointed geologist with the Military Geology Unit, U. S. Geological Survey, Washington.

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